

A New Account of the Genus *Horsfieldia* (Myristicaceae), Pt 3*

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46. *Horsfieldia sabulosa* Sinclair

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Horsfieldia sabulosa Sinclair, Gard. Bull. Sing. 27 (1974) 133 — Type: *Sinclair & Kadim 10491* (K; iso: L; A, B, E, NY, SAR, *n.v.*).

Tree 10-37 m. Twigs stout, terete, neither ridged nor lined but with wart-like thickenings marking the leaf-scars, (3-)5-10(-20) mm diam., grey-brown, non-striate, rather late glabrescent from grey-brown to rusty tomentum with hairs 0.5-1.0(-1.5) mm long; bark lower down grey-blackish, usually longitudinally cracking and often \pm flaking; lenticels inconspicuous. Leaves in 3-5 rows, generally bunched towards the apex of the twigs, coriaceous, elliptic-oblong to (sub) lanceolate, nearly parallel-sided or broadest \pm at the middle, 9-21 \times 2-6 cm, base attenuate, tip acute (to short-acuminate); upper surface glabrous, \pm shining or not, olivaceous to brown, lower surface rather pale brown, early glabrescent, with scattered dark brown to blackish dots, these roundish or sometimes elliptic or line-shaped; midrib flat above, glabrous; nerves 12-20 pairs, flat above and below, the lateral arches and the tertiary venation invisible; petioles long in proportion to the blades, 25-50 \times 2-4 mm, rather late glabrescent, tomentum with hairs 0.5-1.5 mm; leaf bud rather short and stout, 10-15 \times (3-)4-5 mm, with dense grey-brown to rusty tomentum with hairs 0.5-1.5 mm long. Inflorescences behind the leaves on older twigs of 15-20 mm thick, emerging from the axils of the rough and woody wart-like petiole-scars on the older bark, densely pubescent with hairs 1.0-1.5 mm long; in σ (submature seen on *San 15146*): 4-5 \times 2-3 cm, c. 2-3 times ramified, many-flowered, flowers in loose clusters of 5-10 each; common peduncle c. 15 mm long; ρ inflorescences \pm few-flowered, 3-5 cm long; bracts elliptic to lanceolate, \pm boat-shaped, 4-15 mm long, densely pubescent with hairs 0.5-1.5 mm but glabrous inside, late caducous; flowers 3-(or 4-) valved, perianth glabrous, pedicels glabrous, at base articulate. Male perianth (immature) globose or depressed-globose, c. 0.7 \times 1.0 mm; pedicel c. 0.8-1.0 mm long; perianth (in bud) with valve-sutures to c. $\frac{1}{2}$ -way, buds not collapsing on drying; valves c. 0.2 mm thick. Androecium (immature) \pm globose c. 0.4 \times 0.5-0.6 mm, \pm circular in transverse section; anthers c. 12-15, \pm completely sessile, apical cavity small; androphore narrow, \pm 0.2 mm long. Female flowers (according to Sinclair, l.c., p. 134): ovary immature, glabrous. Fruits 1-6 per infructescence, ovoid, top and base broadly rounded, 3.0-5.0 \times 2.5-4.0 cm, glabrous, drying dark brown to somewhat bluish black, not warted; pericarp hard, 5-8(-10) mm thick; stalk 2-8 mm long; perianth not persisting.

Distribution. Borneo: Sarawak (Serian Dist., Bintulu Dist., Mulu Nat. Park), Brunei, Sabah (Sipitang).

*Continued from Gdns' Bull. Sing. 38 (1): 144.

BORNEO. Sarawak: *Brunig* 956; (*Chai*) *S.* 39647; *Sinclair & Kadim* 10248 — Brunei: *BRUN* 579, 0828; *Sinclair & Kadim* 10437, 10491 — Sabah: *San.* 15146, 17560.

Ecology. A moderate to large tree of mixed forest on sandy or peaty soil, deep yellow sands, sandy loam, or heavy yellow clay soil; in *Agathis* forest, ridge forest; 0-100 m alt. Flowers May & June, fruits May to December.

Vernacular name. Kumpang-perawan (Iban).

NOTES

1. *Fieldnotes.* Tall tree, buttresses absent. Bark dark grey, bark of trunk longitudinally fissured. Sap red, copious. Inner bark reddish brown, laminated, fibrous; sapwood soft, pinkish, with a hollow centre c. 2.5 cm wide. Leaves glossy above, very glaucous beneath, midrib greenish yellow. Fruits yellow, inside apricot; ramiflorous with many fruits on each branch.

2. A very characteristic species because of its thick branches with bunched leaves, the leaves with long petioles in (3-) 5 rows, ramiflorous. *Sinclair* discussed its relationship with *H. wallichii*, which has resembling fruits. This has also almost similar dark brown dots on the lower leaf surface.

3. According to *Koster and Baas* (1981, p. 152) the leaves have the unique feature of having an iso-bilateral mesophyll.

47. *Horsfieldia atjehensis* de Wilde, *sp. nov.*

Fig. 1B(47)

Horsfieldia amygdalina auct. non (Wall.) Warb.: *Merrill, Contr. Arn. Arb.* 8 (1934) 61.

Folia ramulorum fertilium sparsa, subtus punctis sparsis fusco-brunneis non-traumaticis induta (ut in *H. glabra*), cortice ramulorum delapso. — Type: *W. & C.M. Bangham* 882 (K; iso: A, NY, n.v.).

Tree c. 10 m. Twigs terete, not ridged, towards the top 3.5-5(-8) mm diam., rather pale grey-brown to yellowish brown, early glabrescent, tomentum grey-brown with hairs less than 0.1 mm, lower down with the bark coarsely striate and tending to flake; lenticels rather conspicuous towards the top of the twig. Leaves in 3-5 rows, thinly chartaceous, obovate-oblong or elliptic-oblong to oblong-lanceolate, broadest slightly above the middle, 13-25 × 4.5-9 cm, base long-attenuate, tip acute-acuminate; upper surface drying dark brown; lower surface early glabrescent, provided with regularly scattered brown to blackish non-traumatic larger dots (lens!); midrib flat above; nerves 10-12 pairs, flat above, marginal arches indistinct; tertiary venation forming a lax network indistinct or invisible on both surfaces; petioles 12-15 × 2.5-3.5 mm; leaf bud densely grey-brown pubescent with hairs less than 0.1 mm, moderately slender, c. 15 × 3.5-4 mm. Inflorescences situated behind the leaves, very thinly pubescent to glabrescent, hairs less than 0.1 mm; in ♂: c. 3 times ramified, rather many-flowered, 7-14 × 4-10 cm, common peduncle 10-20 mm long; ♀ inflorescences not seen; bracts elliptic-oblong, finely pubescent, 2-4 mm, caducous. Flowers 3-valved, in the male in loose clusters of 4-8 each, glabrous; pedicels glabrous, at base inarticulated. Male perianth (slightly immature) globose, c. 1.5 mm diam., at anthesis cleft to c. 1/2-way; valves c. 0.2(-0.3) mm thick; pedicel slender, 1-1.5 mm long. Androecium subglobose to short-ellipsoid, c. 1.2 × 1.0 mm, top broadly rounded, in transverse section subcircular; anthers 11, almost completely sessile, free apices c. 0.1(-0.2) mm, curved over and ± into the rather narrow apical cavity c. 0.3 mm deep;

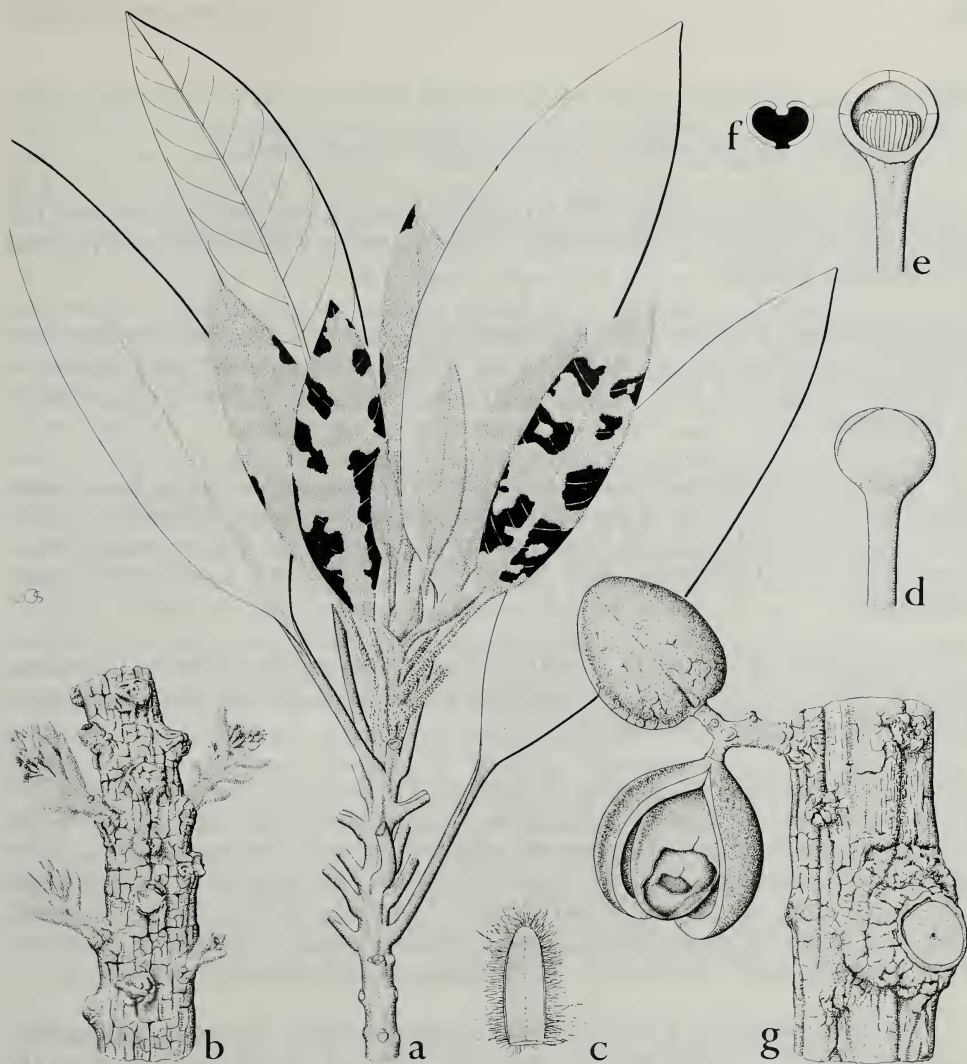


Fig. 22. *Horsfieldia sabulosa* Sinclair.

a. shoot apex with densely bunched leaves with dispersed phyllotaxis, tomentum of young leaves partially fallen, $\times \frac{1}{2}$; b. older wood with leaf scars in dispersed phyllotaxis and immature male inflorescences, note bracts, $\times \frac{1}{2}$; c. smaller bract, $\times 12$; d. immature male flower, lateral view, $\times 12$; e. ditto, longitudinally opened, showing androecium, $\times 12$; f. longitudinal section of androecium, schematic, $\times 12$; g. old wood with infructescence, fruits mature, seeds completely covered by aril, $\times \frac{1}{2}$. — a-f. from *San. 15146*; g. from *BRUN 0828*.

column broad, spongy-solid; androphore narrow, c. 0.2(-0.3) mm long. Female flowers and fruits not seen.

Distribution. Known from only one collection in N. Aceh, Sumatra.

Ecology. Mountainous forest at c. 1300 m (3500-5000 ft.); male flowers, still immature in January.

NOTES

1. *Fieldnotes*. Leaves leathery, glabrous, flower buds green.

2. This is in many respects much related to and \pm intermediate between *H. amygdalina*, *H. glauca*, *H. macrothyrsa*, and *H. sparsa*, but still markedly distinct from all these species.

H. amygdalina, a species from continental SE. Asia and the Andaman Isls. (not known from the Nicobar Isl. and Malaya), differs in general habit and further by the absence of blackish dots on the lower leaf surface and by the darker colour of the dried twigs.

H. sparsa from lowland Peninsular Thailand, Malaya, and Sumatra, has a rather similar general habit, with a similarly pale bark on the twigs, but differs by the absence of blackish dots on the lower leaf surface, and by the flowers which have a rather different androecium with less anthers (7-9), and a generally longer androphore.

H. macrothyrsa, occurring in N. and C. Sumatra, also in mountainous forest, has punctate leaves, but differs in the distichous phyllotaxis, and the much larger male flowers with a different androecium.

Hitherto *H. glabra* (var. *glabra*) is found on Sumatra only in the lowland in the southern part, and all specimens from that area strongly differ in general habit and have the leaves distichous. The present new species has in common with *H. glabra* the punctate leaves but differs in various characters *viz.* a stouter habit, the leaves in 3-5 rows along the twigs, the bark rather pale and coarsely striate, tending to flake, and probably in the slightly smaller male perianths. Furthermore, it was found rather distant from the area of *H. glabra* at a much higher altitude.

3. The Kew-specimen was identified by Sinclair as *H. sucosa* in 1959; in his treatment of 1975 it is enumerated under *H. bracteosa*. In the publication on the Bangham collections by Merrill (1934) the collection was treated under *H. amygdalina*.

48. *Horsfieldia sucosa* (King) Warb.

Fig. 1B(48)

Myristica sucosa King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 301, pl. 172 — *Horsfieldia sucosa* (King) Warb., Mon. Myrist. (1897) 322; Sinclair, Gard. Bull. Sing. 16 (1958) 416 (p.p., incl. lectotype, excl. fig. 45 = *H. sparsa*), pl. XII A; 28 (1975), 139 p.p. — Syntype: *King's Coll.* 4078, 4647 (fr., lecto: K, L; CAL, G, n.v.; see notes), 10475; *Wray* 467; *Maingay* (Kew Dist.) 1300.

H. bracteosa Henderson, Gard. Bull. Str. Settl. 7, 2 (1933) 120, pl. 30; Sinclair, Gard. Bull. Sing. 16 (1958) 419, fig. 46 — *H. bracteosa* var. *bracteosa*: Sinclair, Gard. Bull. Sing. 28 (1975) 18. — Type: *Henderson* SFN 24521 (SING, n.v.; iso: K; DD, n.v.).

Tree 6-20 m. Twigs terete, neither lined nor ridged, towards the apex 2-10 mm diam., pale grey-brown or straw-coloured, contrasting with the blackish colour of the dried petioles, (very) early glabrescent, tomentum rusty to greyish, hairs 0.1-0.3 mm long; lower down the bark rather coarsely striate or not, with a tendency to flake, lenticels rather conspicuous only on the very young parts. Leaves in 2 or 3 rows, membranous to thin-chartaceous, elliptic-oblong to oblong-(ob) lanceolate, broadest at or above the middle, 14-28 \times 4.5-8.5 cm, base attenuate or long-attenuate, tip acute-acuminate; upper surface glabrous, drying greenish-brown to blackish-brown, often with a greenish tinge, lower surface early glabres-

cent, drying light brown, without larger blackish dots; midrib flat above or only slightly raised, glabrous; nerves 13-17 pairs, slender above, flat or slightly raised, lateral arches indistinct; tertiary venation forming a lax network indistinct or invisible above; petioles $10-20 \times 2-3$ mm, early glabrescent; leaf bud c. $10-15 \times 2-3$ mm, with rusty to greyish brown tomentum of hairs 0.1-0.3 mm long. Inflorescences situated behind the leaves, thinly pubescent or late glabrescent from hairs 0.1-0.2 mm long; in ♂: 3 or 4 times ramified, many-flowered, rather lax or condensed, $7-19 \times 5-16$ cm, common peduncle 10-20 mm long, flowers in clusters of 3-7 each; ♀ inflorescences rather few-flowered, 1-2 cm long; bracts \pm ovate-elliptic to lanceolate, acutish, pubescent, 1.5-4 mm long, rather late caducous; flowers either mostly 2-valved (Borneo, see further under the subspecies) or mostly 3-valved (Malaya, Sumatra), perianth glabrous, pedicels usually glabrous (see under subsp. *sucosa*), at base distinctly articulate and contrasting with the pubescent branches of the inflorescence. Male perianth globose to depressed globose, top flattish to broadly rounded, base rounded or broadly rounded, $1.2-1.5 \times 1.5-2.0$ mm; pedicel 1.0-2.0 mm long, slender; perianth at anthesis cleft from c. $\frac{1}{3}$ to (nearly) $\frac{1}{2}$ -way, on drying not or only slightly collapsed at the top, valves 0.2-0.3 mm thick. Androecium depressed globose, $0.3-0.6 \times 0.8-1.2$ mm, top flattish or broadly rounded, circular or (in Borneo) broadly ellipsoid in transverse section; anthers 7-11, almost completely sessile towards the incurved apex, column broad, \pm saucer-shaped, with a broad and flattish, rather shallow apical cavity reaching up to nearly $\frac{1}{2}$ -way deep; androphore rather narrow, 0.1-0.3 mm long. Female perianth (only seen in var. *bifissa*): broadly ellipsoid, $2.8-3.5 \times 2.2-3.0$ mm, 2-valved, cleft to c. $\frac{1}{4}$, valves 0.3-0.4 mm thick, pedicels 1-1.5 mm long, when young with minute hairs 0.1 mm long or less towards the base, ovary c. 1.5 mm diam., glabrous, stigma shallowly 2-lobed, c. 0.1 mm high. Fruits 1-4 per infructescence, broadly ovoid-ellipsoid, top \pm narrowly rounded, $2.3-3.5 \times 2.0-2.5$ cm, glabrous, drying blackish with finely granulate surface, sometimes \pm tuberculate; pericarp c. 4 mm thick; stalk 1-2 mm long; perianth in Malayan specimens persistent (see further under the subspecies).

Distribution. Malaya, Sumatra, Borneo.

NOTE. Divided into two geographically separated taxa, mainly based on the differing number of valves of the perianth, a character regarded as important in the genus and on which, *grosso modo*, the genus can roughly be divided into two divisions. It is noteworthy that this character, here on a subspecific level, occurs within the division of species with mainly 3-valved perianths.

KEY TO THE SUBSPECIES

- 1a. Perianths predominantly 3 (or 4)-valved. Malaya, Sumatra a. subsp. *sucosa*
 b. Perianths predominantly 2-valved. Borneo b. subsp. *bifissa*

a. subsp. *sucosa*

Fig. 1B(48)

Perianths predominantly 3-valved, rarely a few 2- or 4-valved; mature male perianths in bud $1.2-1.5 \times 1.5-2.0$ mm; androecium $0.4-0.6 \times 0.8-1.2$ mm; anthers 7-9 (Malaya) or 9-11 (Sumatra). Fruits $2.5-3.5 \times 2.0-2.5$ cm with persistent 3-lobed perianth.

Distribution. Malaya, Sumatra.

MALAYA (Perak, Kelantan, Trengganu, Pahang, Selangor, Malacca, Johore): *FRI* 1252, 4212, 5228, 14088, 14331, 15219, 15603; *Kep. FN.* 97901; *King's Coll.* 4647, 10475; *Phyt. survey Kuala Lumpur* (Millard) 1825; *Maingay* 2422; *SFN* (Sinclair & Kiah) 39937, 40621, 40629.

SUMATRA (Jambi, Palembang, Bengkulu): b.b. 1799, 31936; Kostermans 12020; Lambach 1311; Marsden (Hb. Hooker) s.n.; Roos & Franken 1704.

Ecology. Dry land and seasonal swamp forest; recorded from sandy soils or sandstone; also disturbed forest; 0-500 m alt. Flowers and fruits throughout the year.

Vernacular names. Merampat (Tamuan, Malaya); Pěředah bęsar (Palembang, Sumatra).

NOTES.

1. *Fieldnotes.* Bark smooth or shallowly fissured or thin-scaly. Slash bark laminated, reddish, with sticky reddish exudate. Wood yellowish or pink. Flowers yellow-green or yellow, scentless. Fruits shiny green, turning yellow or yellow-pink or pink-red. Aril orange-red.

2. Dry fruits, over 3.5 cm long, have never been measured, but fresh fruits are recorded as 5-7.5 cm long, with a thick pericarp.

3. As pointed out by Sinclair (1958, p. 418; 1975, p. 140) King's syntype is heterogeneous. Only *King's Coll.* 4647 and *Maingay 1300* (also numbered 2422) belong to the present species. *King's Coll.* 4647 (in fruit) is herewith designated as lectotype.

4. King describes the flowers as externally pubescent; however, as explained by Sinclair (1958, p. 418) that material was very heterogeneous, and most likely this record is erroneous. The flowers of *H. sucosa*, as circumscribed presently, are generally glabrous, but the female flowers of *Kostermans 12012* (Palembang) have pedicels somewhat pubescent towards the base.

5. In the herbarium, most specimens of our present *H. sucosa* subsp. *sucosa* were initially identified by Sinclair as *H. sucosa*, a species accepted besides the related *H. bracteosa*. Later on, most of these specimens were re-identified by Sinclair as *H. bracteosa*; he indicated he was aware of the heterogeneity of his *H. sucosa*, from which I have presently segregated the new species *H. sparsa*. Sinclair's lectotype-specimens of King's material, *King's Coll.* 4647 and 10475, however, are clearly identical with the type of *H. bracteosa*.

b. subsp. *bifissa* de Wilde, subsp. nov.

Perianthia mascula depresso-globosa. 1.2-1.4 × 1.5-1.7 mm, praecipue 2-valvata; androecium depresso-globosum, 0.3-0.4 × 0.8-0.9 mm, antheris 7. Fructus 2-2.5 cm longi, eius perianthium non-persistens.
— Type: Kutei, *Soengeng 58* (L; iso: BO, n.v.).

Perianths predominantly 2-valved, the odd 3-valved perianth present; mature male perianths in bud 1.2-1.4 × 1.5-1.7 mm; androecium 0.3-0.4 × 0.8-0.9 mm; anthers 7. Fruits c. 20-25 × 20 mm, the perianth ± caducous, 2-lobed.

Distribution. Borneo: E. Sabah, E. and S. Kalimantan.

BORNEO, E. Sabah: *Elmer 21607*; *San. 68452, 73922* (NT 169). — E. & S. Kalimantan: *Afriastini 195*; *Endert 3213*; *Kostermans 8081, 9973*; *Soengeng Reksodihardjo 59*; *Hubert Winkler 2373, 2695*.

Ecology. Lowland forest; on sandy loam soil, sandy ridge in *Shorea laevifolia* forest; 0-800 m. Flowers and fruits throughout the year.

NOTES

1. *Fieldnotes.* Bark smooth, undulately fissured; inner bark c. 10 mm thick, laminated, reddish-brown or yellow-brown; wood whitish or pale brown, or reddish. Flowers yellow, the males very fragrant.

2. Specimens of the present new subspecies were formerly determined by Sinclair as *H. sucosa* var. *microcarpa*, a name later on (1975, p. 20) published as *H. bracteosa* var. *microcarya* Sinclair. Other specimens belonging to Sinclair's var. *microcarya*, incl. the type, are presently referred to a new species *H. pallidicaula*.

3. *H. sucosa* is vegetatively very similar to *H. pallidicaula* and *H. sterilis*, the two being markedly different in the male flowers; these have a differently built androecium, and the pedicels are inarticulate at the base.

4. It seems as if the distributional area excludes that of the related and resembling species *H. pallidicaula*.

49. *Horsfieldia pallidicaula* de Wilde, *sp. nov.*

Fig. 1B(49)

Cortex ramulorum pallidus, cinereus, non fusco-brunneus. Folia disticho vel sparsa, subtus non-punctata. Perianthia mascula subglobosa, 1.5-2 mm diam., 3-vel 4-valvatis; pedicelli graciles, 1-2 mm longi, basi non-articulati. Fructus late ellipsoidei, in sicco nigrescentes, perianthio persistente. — Type: *Jacobs 5413* (L: iso: K: SAR, G. US. CANB. B. S. SING. *n.v.*).

Tree 7-20 m. Twigs terete, neither lined nor ridged, towards the apex 2-10 mm diam., pale, whitish or greyish brown, contrasting with the blackish colour of the dry petioles (or petioles often greyish in the lower half), early glabrescent, tomentum with rusty or greybrown hairs 0.1-0.3 mm long; the bark lower down finely striate or not, slightly flaking or not, lenticels generally inconspicuous or absent. Leaves either in 2, 3 or 5 rows, membranous, oblong to oblong-lanceolate, broadest at or above the middle, 10-30 × 4-9.5 cm, base long-attenuate, tip acute-acuminate; upper surface drying brown to blackish-brown, lower surface drying brown to grey-brown, without larger blackish dots, early glabrescent; midrib flat or slightly raised above, glabrous; nerves 10-18 pairs, slender above, flat or slightly raised, lateral arches not distinct; tertiary venation forming a lax network, indistinct above; petioles 10-25 × 1.5-3 mm, early glabrescent; leaf bud rather stout to slender, 7-10 × 2-4 mm, covered by brown-grey rusty tomentum of hairs (0.1-) 0.2(-0.3) mm long. Inflorescences situated generally behind the leaves, glabrescent, tomentum weak, with hairs 0.1-0.2 mm; in ♂: (2 or) 3 times ramified, many-flowered, 3-9 × 2.5-7 cm, common peduncle up to 7 mm long (hence inflorescences often also ramified from near the base), the flowers more or less in clusters of 2-4; ♀ inflorescences rather few-flowered, 1-3 cm long; bracts lanceolate, acute, finely pubescent, 1-3 mm long, caducous; perianths 3- or 4-valved, in ♀ sometimes 2-valved, glabrous, pedicel glabrous, at base inarticulate. Male perianth globose or broadly obovoid, 1.5-2.0 (-2.2) mm diam., top (broadly) rounded, base rounded to short-attenuate; pedicel 1-2 mm, slender; perianth at anthesis cleft to c. 1/3 to nearly 1/2-way deep, not or but slightly collapsing on drying, valves 0.2-0.3 mm thick. Androecium short-ellipsoid to somewhat depressed-globose, 0.8-1.2 × 0.8-1.2 mm, top rounded, circular in cross-section; anthers 8-10, completely sessile (i.e., free apices 0-0.1 mm long only), incurved towards the apex of the androecium; column

broad and solid with a small and narrow apical cavity, 0.1-0.2 mm deep only; androphore narrow, short, 0-0.2 mm long. Female perianth broadly ellipsoid or subglobose, c. $2.5-3.0 \times 2.5$ mm, cleft at anthesis to $\frac{1}{4}-\frac{1}{3}$, valves (0.2-) 0.3 mm thick, pedicels 1-1.5 mm long, ovary subglobose to broadly ovoid, $1.7-2.0 \times 1.5-2.0$ mm, glabrous, stigma shallowly 2-lobed, lobes 0.1-0.2 mm long. Fruits 1-5 per infructescence, broadly ellipsoid, top and base rounded, $1.5-4.0 \times 1.0-3.0$ cm, glabrous, drying blackish, finely granulate and sometimes tubercled, pericarp various; stalk 1-3 mm long; perianth persisting under the fruit (always?) (see further under the varieties).

Distribution. Three varieties in Borneo (Sabah, Sarawak).

KEY TO THE VARIETIES

- 1a. Fruits $15-17 \times 10-12$ mm; pericarp 1-1.5 mm thick. Leaves up to 23 cm long **b. var. *microcarya***
 b. Fruits larger 2
 2a. Fruits c. $20-22 \times 18$ mm; pericarp 2-3 mm thick. Leaves up to 25 cm long **a. var. *pallidicaula***
 b. Fruits $37-40 \times 27-30$ mm; pericarp 6-8(-10) mm thick. Leaves 25-30 cm long **c. var. *macrocarya***

a. var. *pallidicaula*

Fig. 1B(49)

Leaves 10-25 cm long, up to 7.5 cm wide. Fruits c. $20-22 \times 18$ mm; pericarp 2-3 mm thick; stalk and perianth not seen.

Distribution. Borneo: Sarawak, West Sabah, West Kalimantan (doubtful, see notes).

BORNEO. Sarawak (1st, 3rd Div., Baram Dist.): *Jacobs* 5413; *Hose* 29, 86; *S.* 14971, 37692, — Sabah (West): *SAN.* 15254, 76783, 80505. — West Kalimantan: *Hans Winkler* 1435 (doubtful).

Ecology. Primary lowland and lower mountainous forest, recorded from sandstone; 0-700 m alt. Flowers throughout the year, fruits in June.

Vernacular name. Kumpang balau (Iban).

NOTES

1. *Fieldnotes.* Bark smooth, dark grey; sapwood white-red. Perianth yellow or yellow-green, androecium pale pink-yellow, pollen white.

2. The three varieties presently recognized are sympatric and are very similar in the vegetative characters. They are mainly distinguished by the remarkable differences in fruit-size, and hence I am not quite sure to which variety the male flowering material belongs.

The only known fruiting specimen regarded as belonging to the type-variety is *San.* 15254, with fruits of c. 21×18 mm and of which the calyx is lost.

Also, of the only two known female flowering specimens one cannot be sure to what variety they belong for the same reasons.

3. All three varieties of the presently proposed new species are vegetatively also very similar to the related species *H. sucosa* and *H. sterilis*, but both these differ essentially in the male flowers.

4. Most specimens of our present vars. *pallidicaula* and *microcarya* were at first identified by Sinclair on the sheets as *H. sucosa* var. *microcarpa*, and in 1975 published as *Horsfieldia bracteosa* var. *microcarya*.

5. A noteworthy deviating specimen. The collection *Hans Winkler 1435*, from West Kalimantan, Sungei Bika, 5.1.1925, with mature male flowers, keys out together with *H. pallidicaula*. It deviates in general habit by its very thin membranous leaves which dry greenish. The inflorescences are rather weak, the flowers small, slightly longer than broad c. 1.5×1.4 mm, pedicel c. 1-1.5 mm, perianth-valves 3, thin, splitting the bud to nearly $\frac{1}{2}$ -way, the androecium is subglobose, c. $0.8-0.9 \times 0.7-0.8$ mm, \pm sessile, anthers c. 9, sessile, the central-apical cavity being narrow and c. 0.2 mm deep. The specimen was collected in a marshy forest at c. 50 m alt. Possibly it represents a separate taxon. The specimen was determined by Sinclair as *H. carnosa*, which it certainly is not.

b. var. *microcarya* (Sinclair) de Wilde, *comb. nov.*

Horsfieldia bracteosa Henderson var. *microcarya* Sinclair, Gard. Bull. Sing. 28 (1975) 20 — Type: *Wood & Kapis San. 16971* (K; iso: L; KEP, SAN SING, n.v.).

Leaves to 20 cm long, up to 7.5 cm wide. Fruits c. $15-17 \times 10-12$ mm; pericarp 1-1.5 mm thick; stalk c. 2 mm long, persistent perianth 3-lobed.

Distribution. Borneo: West Sabah, possibly E. Kalimantan.

BORNEO. West Sabah: *Wood & Kapis San. 16971*.

Ecology. Lowland forest at c. 100 m. Fruits in July.

NOTE. Known only from the type, a collection which vegetatively completely fits the species generally, but distinct in its particularly small fruits with persistent 3-lobed perianths. Possibly here belongs *Leigton 943* (E. Kutei; fruits not seen).

c. var. *macrocarya* de Wilde, *var. nov.*

Differt a var. *pallidicaula* fructibus siccis c. 4 cm longis, pericarpio sicco 6-8(-10) mm crasso. — Type: *Ding Hou 474* (L).

Leaves $23-30 \times 6-9.5$ cm. Fruits $35-40 \times 25-30$ mm; pericarp 6-8(-10) mm thick; stalk 1-2 mm long, persistent perianth 2- or 3-lobed.

Distribution. Borneo: Sarawak (4th and 5th. Division)

BORNEO. Sarawak: *Ding Hou 474*; *S 32299*.

Ecology. Lowland mixed Dipterocarp forest; yellow sandy clay soil; 30-200 m alt. Fruits in July and October.

NOTES

1. *Fieldnotes.* Bark recorded as smooth to slightly flaky, or as longitudinally fissured. Fruit pink, aril pink.

2. Known only from the type, with mature fruits, and one collection (*S 32299*) with immature fruit. Both have persistent perianths. These in the type are apparently 2-lobed, the ones of *S 32299* are 3-lobed.

50. *Horsfieldia sparsa* de Wilde, *sp. nov.*

Fig. 1B(50)

Horsfieldia sucosa auct. non (King) Warb.: Sinclair, Gard. Bull. Sing. 16 (1958) 416, fig. 45, plate XII A; 28 (1975) 139.

Cortex ramulorum pallidus, cinereus, non fusco-brunneus. Folia sparsa, subtus sine punctis brunneis non-traumaticis. Perianthium masculinum subglobose, c. 2 mm diam, 3-5 valvatum, pedicello basi non-articulato. Androecium depresso-globose, 0.8-1.2 mm diam., antheris 7-9. Fructus ellipsoidei 3-5.5 cm longi, in sicco nigrescenti, perianthio non-persistenti. — Type: Malaya, *Ogata Kep. 110406* (L^r iso: K).

Tree 15-40 m. Twigs terete, neither lined nor ridged, towards apex 4-11(-15) mm diam., pale whitish brown or grey-brown, contrasting with the brown-black colour of the dried petioles, early glabrescent, tomentum brown or grey-brown, hairs 0.1-0.2 mm; bark lower down rather smooth or coarsely striate, sometimes with a tendency to flake, lenticels present but conspicuous only towards the apex. Leaves crowded or not towards the apex, arranged in 3-5 rows, thickly membranous to chartaceous, oblong to oblong-lanceolate, broadest at or above the middle, (10-) 18-24 × 3.5-7 cm, base long-attenuate, top acute-acuminate; upper surface drying bright brown to dark brown, lower surface drying bright brown, glabrous (early glabrescent), without larger blackish dots; midrib above flat or slightly raised, glabrous; nerves 12-16 pairs, above slender, flat or slightly raised, lateral arches not distinct; tertiary venation forming a lax network, not or hardly visible above; petioles (12-)14-34 × (1.5-)2-3 mm; leaf bud rather stout, relatively short and broad, c. 8-12 × 3-5 mm, with dense tomentum of hairs c. 0.1-0.2 mm long. Inflorescence behind the leaves, subglabrous or early glabrescent, tomentum very weak, of hairs c. 0.1-0.2 mm; in ♂: 2 or 3 times ramified, many-flowered, 6-12 × 4-6 cm, common peduncle (2-)5-15 mm long, the flowers ± fasciculate in clusters of 4-10 each; ♀-inflorescences (only known in fruit) rather few-flowered, c. 1.5-3 cm long; bracts minute, very early caducous; flowers 3 or 4(or 5)-valved, perianth glabrous, pedicel glabrous, at base not or only in a few cases indistinctly articulate. Male perianth globose or slightly depressed-globose, 1.5-2.0 × 2-2.5 mm, top and base (broadly) rounded, glabrous; pedicels 2-4 mm long, slender, glabrous; perianth at anthesis cleft to 1/3-1/2, not or but slightly collapsing on drying; valves 0.1-0.2 mm thick. Androecium subglobose or depressed-globose, 0.8-1.0 × 1.0-1.2 mm, top broadly rounded, circular in transverse section; anthers 7-9, almost completely sessile, incurved at the apex; central column broad and solid without an apical cavity or minute, or rarely (see note) rather broad and shallow, 0-0.4 mm deep, sometimes with a short protuberance; androphore rather slender and distinct, c. 0.3-0.4 mm long. Female perianth (only known from very young fruit) c. 3 mm long, 3-or 4 valved, glabrous; ovary glabrous. Fruits 2-4 per infructescence, ellipsoid, top (narrowly) rounded, base rounded, 3.0-5.5 × 2.5-4.5 cm, glabrous, drying blackish, finely granulate and sometimes ± tuberculate, pericarp (4-)5-15(-20) mm thick; perianth not persisting under the fruit; stalk 5-7 mm long.

Distribution. Peninsular Thailand, Malaya, Singapore, Sumatra.

THAILAND. Peninsular: (*Phusomsaeng 411*) *Fl. Thailand 40961*.

MALAYA (Perak, Kelantan, Selangor, Trengganu, Pahang, Negri Sembilan, Johore): *FRI 0609, 3530, 7819, 7982, 8346, 8909, 14412, 14463, 14500, 14750, 25024; KEP 76635, 80805, 94284, 94991, 108878, 110378, 110406; Shah & Noor MS. 1760; SFN (Sinclair) 40155*.

SINGAPORE. *Ridley s.n.; Sinclair s.n.* (L)

SUMATRA. Riau: *Soepadmo 186; Jambi: Roos & Franken 1936*.

Ecology. Primary and secondary dryland forest, also in periodically inundated forest; mainly on sandy soil, sandy loam soil, sandstone; 0-350 m alt. Flowers in March, August; fruits mainly May to July.

NOTES

1. *Fieldnotes.* Erect tree with clear bole, bole once recorded as \pm tapering, once recorded to have buttresses to 1 ft. Bark brown to blackish-brown, shallowly fissured or usually thinly flaking. Inner bark fibrous, pale reddish; copious watery or sticky pink-red juice; slash wood pale, cream to pale pink-brown, red-flecked. Fruits recorded as large, up to 11 cm with thick fleshy pericarp; seeds relatively small, up to 5 cm long; fresh pericarp yellow to orange red, often flushed pink, smooth, waxy, shining.

2. Sinclair recognized the present species as a distinct species under the name *H. sucosa*. Unfortunately, the lectotype-specimens, chosen by Sinclair, belong to the species treated by Sinclair under the name *H. bracteosa*, the latter thus being a later synonym of *H. sucosa*. The other specimens of King's syntype of *H. sucosa* belong to yet other species, as pointed out by Sinclair (1958, p. 418). Our present species, hence, has to be given a new name, with a new type-specimen.

3. Dry fruits reach c. 5.5 cm; according to the field labels the fruits may reach up to 11 cm, with thick fleshy-juicy pericarps, which obviously shrink a lot on drying.

4. *H. sparsa* is well characterized from resembling species like *H. sucosa* and *H. pallidicaula* by its stout whitish twigs, dispersed leaves with a rather chartaceous consistency, the leaves sometimes being crowded towards the thickish and short terminal leaf bud, the relatively long petioles; the inflorescences are nearly glabrous, the flowers 3- or 4-merous, the pedicels at base not or only indistinctly articulate, the androecium is rather distinctly stalked (androphore) and generally without an apical cavity. Only in *Phusomsaeng 411*, from Peninsular Thailand, is the apical cavity in the androecium rather large, reminiscent of *H. sucosa*. The fruits are large, with a particularly thick and fleshy pericarp; the perianth is not persistent. *H. sucosa* has articulate pedicels; *H. pallidicaula* differs with its sessile androecium.

5. The epithet 'sparsa' alludes to the dispersed leaves, an uncommon feature in *Horsfieldia*.

51. *Horsfieldia triandra* de Wilde, *sp. nov.*

Fig. 1B(51); 23

Folia elliptica ad oblonga, 5-9 cm longa. Flores masculi pubescentes, perianthio crasse-carnoso, 3-valvato, in anthesi usque ad c. $\frac{1}{5}$ divisio, androecio \pm turbinato, c. 1.5 mm longo, antheris 3, pro majore parte sessilibus, c. 0.6 mm longis. — Type: Sumatra, *Forbes 2465* (L).

Tree-height unknown. Twigs terete or subterete, not or only faintly ridged, towards the top 1.5-3(-4) mm diam., dark brown, early glabrescent, tomentum rusty, with hairs c. 0.3-0.7 mm long, bark finely and lower down coarsely striate, not flaking, lenticels small but conspicuous. Leaves in 2 rows, membranous to thinly chartaceous, elliptic-oblong to oblong, broadest at or slightly below the middle, 5-9 \times 2-3.5 cm, base (short-) attenuate, top acute-acuminate with conspicuous acumen 8-12 mm long; upper surface glabrous, drying dark olivaceous to dark brown, lower surface brown, glabrous (early glabrescent), without blackish

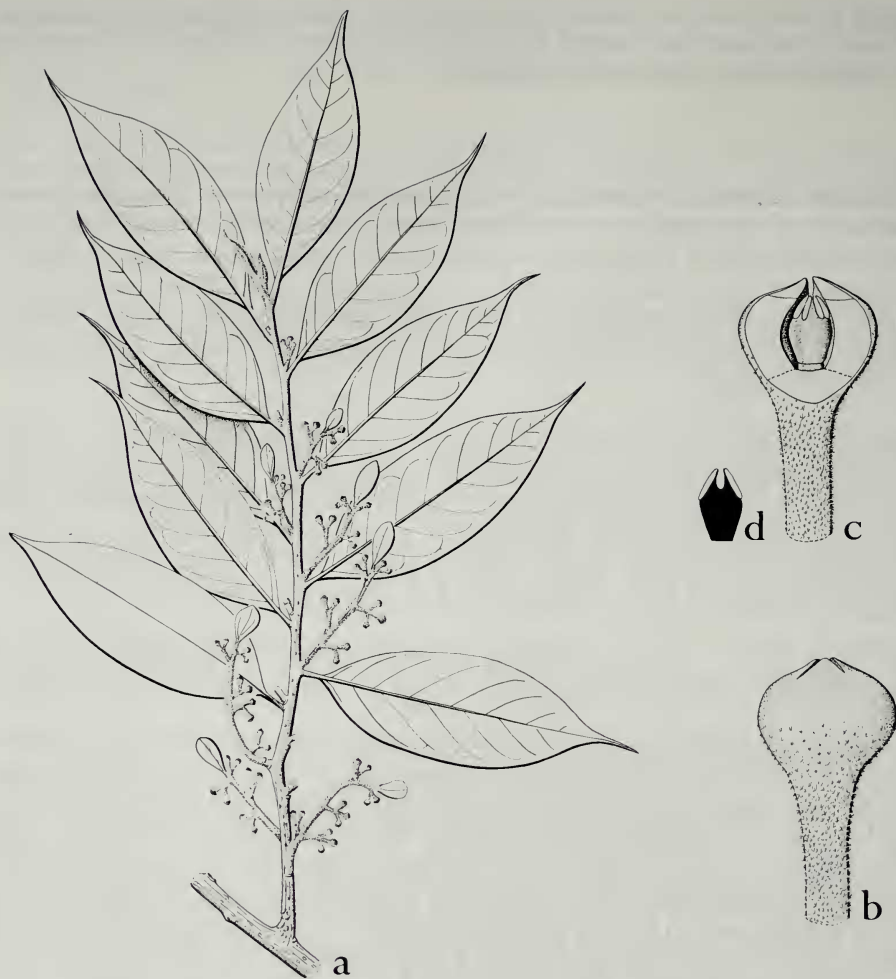


Fig. 23. *Horsfieldia triandra* de Wilde.

a. habit of leafy twig with male inflorescences, note leaf-like bracts, $\times \frac{1}{2}$; b. mature male flower, $\times 6$; c. ditto, longitudinally opened, showing thick-walled perianth, and androecium, $\times 6$; d. androecium, longitudinal section, schematic, $\times 6$. — a-d from Forbes 2465.

dots; midrib raised above, glabrous; nerves 6-10 pairs, above flat or \pm sunken; tertiary venation forming a lax network not or scarcely visible on both surfaces; petioles $7-13 \times 1.0-1.5$ mm, early glabrescent; leaf bud c. $6-8 \times 2$ mm, densely rusty pubescent with hairs 0.3-0.7 mm long. Inflorescences densely rusty pubescent with hairs c. 0.3-0.4 mm, in σ : 1 or 2 times ramified; flowers not many (10-20 flowers per inflorescence and in different stages of development) $3-5 \times 1-2$ cm, common peduncle 3-10 mm long, flowers solitary or in loose clusters of 2-4 each; bracts ellipsoid-oblong, pubescent, 2-3 mm long, caducous, and usually with one (rarely 2) persistent subterminal bract, enlarged and resembling a small foliage leaf, 5-12 mm long (see notes). Flowers 3-valved, perianth towards the apex glabrous, lower down finely pubescent, pedicel pubescent with hairs 0.2-0.4 mm, inarticulate at base. Male perianth \pm obconical-obovoid, the top broadly rounded or with a blunt tip, base tapering, c. 2.5×2.5 mm, glabrous in the upper half, pubescent with hairs 0.2-0.4 mm long towards the base; pedicel 3-4 mm long, slender; perianth at anthesis cleft for only c. $\frac{1}{5}-\frac{1}{6}$, not collapsing on drying, valves at apex c. 0.2, towards the base c. 0.4 mm thick, \pm clasping the anthers, at anthesis hardly

opening, the basal part of perianth thick-walled, 0.8-1.0 mm thick. Androecium incl. androphore \pm turbinate, $1.5-1.7 \times 0.6-0.8$ mm, subcircular in transverse section; anthers 3 (6 thecae), acutish, suberect, subsessile, 0.6-0.7 mm long, the apical c. 0.3 mm mutually free; androphore \pm obconical, tapering, c. $1.0 \times 0.6-0.7(-0.8)$ mm, above continuing into the column. Female flowers and fruits not seen.

Distribution. C. and S. Sumatra.

SUMATRA. Central (West Coast): *b.b.* 6479 — South (exact locality not known): *Forbes* 2465.

Ecology. Not known; the sterile collection *b.b.* 6479 collected at c. 1000 m alt.

NOTES

1. *Forbes* 2465, from Sumatra and without field data, is the only one which is fertile. Sinclair identified it at first as *Pygeum* (now *Prunus*), others as possibly *Platea* and finally as a *Horsfieldia* species.

The mature male perianths deviate from most *Horsfieldias* by the obconical shape and the thick-leathery texture, the perianth opening only slightly at the very top, and the turbinate androecium with only 3 anthers at the top, which are clasped by the perianth-valves before anthesis.

These flowers look as if they might be diseased, but on opening I found flowers and androecia normal. The rather few-flowered inflorescences, which bear one or two leaf-like enlarged bracts in the apical portion also look aberrant, but no trace of disease can be found. Enlarged leaf-like bracts in the inflorescences are occasionally found in the inflorescences of other species, e.g., in *H. irya*.

2. *H. sterilis* from Borneo, *H. pulverulenta* from new Guinea, *H. crux-melitensis* (to a lesser extent) and related species from new Guinea have a 2-valved perianth and the following combination of characters, i.e., flowers with a perianth equally thick-leathery, similarly the opening limited to the top of the perianth, and the androecium having a "reduced number" of stamens.

3. A second specimen, *b.b.* 6279, from W. Central Sumatra, at c. 1000 m, is sterile. Sinclair determined it as *H. ridleyana*.

52. *Horsfieldia tristis* de Wilde, *sp. nov.*

Fig. 1B(52)

Folia membranacea ad chartacea, in sicco tristia, gemmis tomento minus quam 0.1 mm longis. Cortex ramulorum pallide brunneus, striati, \pm delapsus. Perianthium masculum late ellipsoideum, c. 3 mm longum, 3-valvatum, in anthesi usque ad $\frac{1}{5}$ - $\frac{1}{3}$ diviso; androecio longiore quam latiore, antheris 12-20. — Type: Sarawak, *Lai Shak Teck* S. 37470 (L; iso: K; KEP, MO, SAN, S, *n.v.*).

Tree 10-15 m. Twigs terete, not ridged, towards the top 3-5(-7) mm diam., early glabrescent, tomentum greyish to rusty, with hairs c. 0.1 mm long or less, bark lower down rather bright brown to yellowish, coarsely striate with a tendency of cracking longitudinally or flaking; lenticels smallish, conspicuous or not. Leaves in 2 rows, membranous to thinly chartaceous, elliptic-oblong to lanceolate, broadest at or slightly above the middle, or \pm parallel-sided, $14-32 \times 4-8.5$ cm, base

attenuate, tip acute-acuminate; above drying dull and to a finely wrinkled or granulate structure, dark olivaceous or olivaceous-brown, lower surface glabrous, olivaceous-brown, without blackish-brown dots; midrib flat or slightly raised above, glabrous; nerves 11-17 pairs, above flat or slightly raised or sunken, the marginal arches indistinct or invisible; tertiary venation forming a \pm lax network, inconspicuous or invisible; petioles 6-12 \times 2.0-5 mm, glabrous; leaf bud slender, 10-15 \times 1.5-2.5 mm, densely greyish to dull-brown pubescent with hairs up to c. 0.1 mm long. Inflorescences glabrous or with a few scattered minute hairs up to c. 0.1 mm, in σ : c. 3 times ramified, rather many-flowered, 5-12 \times 3.5-7 cm, common peduncle 7-25 mm long; ϕ inflorescences (in fruit): c. 2-3 cm long, once or twice ramified. Flowers (σ) in loose clusters 2-5 each, 3- (or 4-)valved, perianth glabrous; pedicel glabrous, at base not articulate; bracts not seen, caducous. Male perianth obovoid-ellipsoid to broadly ellipsoid, 2.8-3.7 \times 2.0-3.0 mm, top broadly rounded, based rounded to short-tapering; pedicel 1.5-5 mm long, slender and well marked off from the perianth; perianth at anthesis cleft to $\frac{1}{5}$ - $\frac{1}{4}$ (to nearly $\frac{1}{3}$); valves 0.2-0.4 mm thick. Androecium obovoid-ellipsoid, top broadly rounded or \pm depressed, in transverse section subcircular or bluntly 3- or 4-angular, 2.0-2.7 \times 1.5-2.0 mm; anthers 12-20, mutually appressed, almost completely sessile with free apices 0-0.1(-0.2) mm long, column broad and solid with a rather broad apical cavity, 0.5-0.8 mm deep, sometimes with a broad and flat base, almost completely concealed by the overcurved anthers; androphore narrow, 0.2-0.3 mm long, largely hidden by the anther-bases. Female flowers not seen. Fruits 4-8 per infructescence, ellipsoid, top subacute, base rounded, c. 1.5 \times 1.2 cm, glabrous, drying blackish, without lenticels or tubercles, pericarp c. 1.5 mm thick; stalk 1-2 mm long; perianth not persisting.

Distribution. Sumatra (E. Coast of Tapanuli), Lingga Arch. (Singkep Isl.), Borneo (Sarawak, S. Kalimantan).

SUMATRA: *Rahmat si Toroes 5486* — Lingga (Sinkep Isl.): *Bünnemeyer 7100*.

BORNEO. Sarawak (1st. Div.): (*Haviland*) *Kalong 1949*; (*Lai Shak Teck*) *S 37470* — S. Kalimantan (Sampit): *Kostermans 8043*.

Ecology. Forest on flat land; 0-100 m alt. Flowers in August and November, fruits in September.

Vernacular names. Kajoe penara (Singkep Isl.); Kajoe darodong lomba (Tapanuli).

NOTES

1. *Fieldnotes.* Flowers yellowish, fragrant.

2. It seems closely related to *H. fulva* and allies of that on account of the similar, elongate, male flowers, but in *H. fulva* the leaves dry brown instead of olivaceous, the twigs brown, neither pale nor bright brown, the bark of the twigs does not tend to crack longitudinally, the inflorescences are pubescent, and the pedicels articulate.

3. The plants have rather yellowish twigs and pale, olivaceous leaves, and give a rather pale overall impression; twigs, leaves and inflorescences are almost completely glabrous. Specimens from Borneo were identified by Sinclair as *H. carnosa*, the specimen from Singkep Isl. as *H. glabra* (see note 4), that from Sumatra as *H. irya*.

4. The one from Singkep Isl., *Bünnemeyer* 7100, somewhat deviates by the relatively thin leaves, their upper surface not very distinctly dull and wrinkled and by the rather broadly ellipsoid, almost subglobose, male perianths: its androecium has a very broad apical cavity with a broad, almost flat base.

53. *Horsfieldia fulva* (King) Warb.

Fig. 1B(53)

Myristica fulva King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 297, pl. 124 — *Horsfieldia fulva* (King) Warb., Mon. Myrist. (1897) 297; Sinclair, Gard. Bull. Sing. 16 (1958) 396, fig. 37; 28 (1975) 33. — Syntype: *Maingay* 1304 (2426) (CAL. n.v.; iso: K). *Scortechini* 184 a (CAL. n.v.; iso: BM, K, L; G. n.v.).

Tree 10-20 m. Twigs terete, towards the apex 3-5(-10) mm diam., rather late-glabrescent, tomentum dense, of short-dendroid hairs 0.2-0.3 mm long, lower down with the bark grey or grey-brown, finely to hardly striate; lenticels usually many, not very conspicuous; bark on older twigs not flaking. Leaves in 2 rows, chartaceous to coriaceous, dull, elliptic-oblong to (obovate-) oblong, broadest at or somewhat above the middle, 13-21 × 4-9.5 cm, base attenuate, top acute-acuminate to bluntish; upper surface drying dull pale olivaceous to bright brown, glabrous, lower surface pale brown, glabrous or with some persistent tomentum of hairs 0.2-0.3 mm on and near the midrib and lateral nerves; without larger brown-blackish dots; midrib above flattish or somewhat raised, early glabrescent; nerves 11-14(-18) pairs, above flat to ± sunken, the lateral arches regularly shaped, not distinct; tertiary venation not or hardly visible on both surfaces; petioles 8-13 × 2.5-3.5 mm, glabrous; leaf bud 10-15 × 2.5-3 mm, densely pubescent with hairs c. 0.2-0.3 mm. Inflorescences situated generally behind the leaves, not very densely pubescent, the hairs stellate-dendroid, 0.2-0.3 mm, in ♂: c. 3 times ramified, rather many-flowered, 3-10 × 2-6 cm, common peduncle 2-7 mm long; in ♀: few-flowered, 1-2 cm long; bracts not seen, caducous. Flowers solitary or in loose clusters of up to 5 each, 3-valved, perianth and pedicel glabrous, the pedicels ± articulated at base. Male perianth ellipsoid or ellipsoid-obovoid, 3.0-4.0 × 2.0-2.5 mm, top rounded, base ± attenuate to rounded; pedicel 1-3 mm long, slender; perianth at anthesis cleft to c. 1/5-1/4; valves 0.2-0.3 mm thick. Androecium elongate-ellipsoid, above truncate to rounded, sub-cylindrical to ± 3-angular, 2.0-3.0 × 1.1-3 mm; anthers 10-12, almost entirely sessile, appressed, apices free up to 0.1 mm, the apex of the column narrowly hollowed or cleft to c. 0.3 mm, androphore rather narrow, up to 0.1 mm long. Female perianth (according to Sinclair, 1959, p. 396): long-ellipsoid, 5-6 mm long, 3-valved; pedicel stout, c. 3 mm long; ovary 2.5-3 mm long, glabrous, stigma sessile, bi-lobed. Fruits up to 3 per infructescence, ovoid-ellipsoid, top obtuse to acutish, base broadly rounded, 2.2-2.4(-3.0) × 1.6-2.0(-2.5) cm, glabrous, drying bright brown, without lenticels or warts, dry valves c. 3 mm thick; stalk c. 3-5 mm long; perianth persisting under fruit (always?).

Distribution. Malaya (Perak, incl. Pulau Rumbia, Selangor, Negri Sembilan, Malacca), Sumatra (Jambi Prov.).

MALAYA: *FRI* 16028, 16116, 25623, *Kep. F.N.* 76031, 80627, 98837, 99334; *Maingay* (1304), 2426; *Scortechini* 184a; (*Sinclair*) *SING* 40170.

SUMATRA: Jambi Prov. *Roos & Franken T.F.B.* 1510, 1526

Ecology. Lowland rain forest; undulating country, on ridges; 0-200 m. Flowers and fruits throughout the year.

NOTES

1. *Fieldnotes*. Bark yellowish-brown, thin, shallowly fissured longitudinally but not flaking; inner bark orange; wood white; sap watery, pale pink, not copious. Flowers orange, fruits yellow.

2. Easily recognized by the dull parchment-like leaves when dry; the nerves above are flat or somewhat sunken, and the tertiary venation is not or hardly visible; it is one of the few species with a 3-valved perianth which is elongate and rather large, 3 mm long or more. I agree with Sinclair that it must be closely related to *H. superba*, which is larger in size in almost all aspects, and which has a generally persistent pubescence on the lower leaf surface.

54. *Horsfieldia superba* (Hook. f. & Th.) Warb Fig. 1B(54)

Myristica superba Hook. f. & Th., Fl. Ind. (1855) 162; A. DC., Prod. 14, 1 (1856) 194; Miq., Fl. Ind. Bat. 1 (2), 1 (1858) 62; Hook. f., Fl. Brit. Ind. 5 (1886) 105; King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 298, pl. 124 *bis*, 125 *bis*. — *Horsfieldia superba* (Hook. f. & Th.) Warb., Mon Myrist. (1897) 295; Corner, Wayside Trees Mal. 1 (ed. 1940 & 1952) 476; Sinclair, Gard. Bull. Sing. 16 (1958) 393, fig. 36, pl. X B; 28 (1975) 141. — Type: *Phillips s.n.* (K; iso: LE. *n.v.*).

Tree 10-30 m. Twigs terete or sometimes faintly angular, stout, towards the apex 5-8(-13) mm diam., rather late-glabrescent, tomentum dense rusty, composed of dendroid hairs 0.5-1.0 mm long, lower down with the bark dark grey, finely striate, lenticels usually many and conspicuous; bark on older twigs sometimes slightly cracking and flaking. Leaves usually in 2, sometimes in 3 rows (see notes), coriaceous, dull, elliptic-oblong to oblong, broadest usually at about the middle (17-)25-40(-70) × (7.5-)10-18(-22) cm, base narrowly subcordate to short-attenuate, top bluntish to acute-acuminate; upper surface drying dull with finely wrinkled structures, olivaceous to grey-brown, glabrous or glabrescent (except sometimes the midrib), lower surface with brown or bright brown rather sparse to dense "mealy" tomentum of dendroid hairs of mixed sizes, c. (0.3-)0.5-1.0 mm long, usually with many or few emerged hairs to c. 1.5 mm long; no larger brown-blackish dots present; midrib rather broad, flat above, pubescent or glabrescent; nerves 15-25(-30) pairs, above flat or sunken, the lateral arches fairly regularly shaped, not very distinct above; tertiary venation not or hardly visible on both surfaces, petiole 6-15 × 5-7 mm, rather late glabrescent; leaf bud 20-30 × 5-10 mm, densely pubescent by hairs 0.5-1.5 mm long. Inflorescences behind the leaves, moderately densely ± woolly pubescent with rather long-branched yellowish-brown dendroid hairs c. 0.5-1.0 mm long; in ♂: rather many-flowered, 2 or 3 times ramified, 7-15 × 2.5-10 cm, common peduncle 10-15 mm; in ♀: ± few-flowered, little branched, 2-5 cm long; bracts broadly ellipsoid, subacute-acuminate, up to 12 × 10 mm, densely pale brownish pubescent, caducous. Flowers (♂) up to c. 5 in a cluster, perianth 3- or 4-valved, glabrous, drying often with a grey-bluish tinge, the pedicels slender, glabrous, at base inarticulate. Male perianth ellipsoid to obovoid-ellipsoid, 6-7(-8) × 4-5 mm, top rounded, base rounded to short-attenuate, glabrous; pedicel 1.5-3.5(-5) mm; perianth at anthesis cleft to c. 1/5-1/4; valves c. 0.4 mm thick. Androecium elongate-ellipsoid, subtruncate above, the apex sterile (i.e., not bearing anthers) for c. 0.5 mm (always?), with a shallow tri-radiate crack, base subtruncate, subcylindrical to 3-angular in transverse section, c. (4.0-) 4.5-5 × 2.2-2.5 mm; anthers 16-20, completely sessile, mutually appressed; androphore rather narrow, 0.1-0.4 mm long. Female perianth ellipsoid, c. 7.0-8.0 × 4.5 mm, glabrous, cleft at anthesis to c. 1/5, valves rather coriaceous, c. 0.5 mm thick; pedicel stout, 2-3.5 mm long, glabrous; ovary ovoid, slightly laterally compressed, c. 4-4.5

× 3.0 mm, glabrous, stigma shallowly 2-lobed, broad, c. 0.5 × 1.5 mm. Fruits 1-3 per infructescence, broadly ovoid-ellipsoid, top and base rounded, c. 3.8-5.5 × 2.8-4.5 cm, glabrous, drying dark brown, often ± coarsely warty and wrinkled, valves ± fleshy, when dry 8-12 mm thick; stalk stout, c. 3-6 mm long; perianth-parts persistent under the fruit.

Distribution. Malaya (all states except three), Singapore, Sumatra (Central-West).

MALAYA. *Ahmat F.M.S.* 4867; *Curtis* 2966; *FRI* 0739, 4511, 5416, 10512, 16040, 17076, 25695; *Hervey s.n.*; *Holmberg* 2100; *Kadim & Noor* 364; *Kep FN* 70473, 80618, 93151, 94998, 98192, 109000; *King's Coll.* 8024; *Phillips s.n.*; *Ridley* 10526; *Scortechini s.n.*; *Shah & Noor MS* 1894; *SFN.* 28703, 40496, 40570; *Soepadmo* 758; *Zainudin & Kasim* 01687.

SINGAPORE. *SFN* (SING) 36141, 40047, 40174, 40688.

SUMATRA. *b.b.* 23701; *Koorders* 10383.

Ecology. Forest on alluvial soils, undulating country, also in swampy forest; 0-400 m alt. Flowers visited by bees (*Whitmore FRI* 4511). Flowers August to October, most fruits collected May to August.

NOTES

1. *Fieldnotes.* Bole straight. Bark longitudinally fissured or distantly dippled or cracked. Bark slash brittle, gritty; slash wood soft, white to yellowish. Leaves glossy above, becoming dull with drying. Flowers bright yellow, smell unpleasant or of ripe pears, visited by bees. Fruits globose, greenish-yellow, yellow, or orange.

2. Sinclair suggested (l.c., p. 141) to place the present species together with the much related *H. fulva* in a separate series of their own, mainly on account of the oblong staminal column and the oblong or obovoid male perianth.

3. I have not seen the collection *Koorders* 10383, in BO, from Central Sumatra. The specimen *b.b.* 23701, from Sumatra, West Coast, at 400 m, is sterile, and has the leaves in 3 rows. Apparently this is the top of a robust erect-growing orthotropic sterile shoot. However, in *Whitmore FRI* 4511 (Malaya), fertile male-flowering, the leaves are — possibly by way of exception — arranged in 3 rows, and evidently not distichous as in the remainder of the material.

4. Sterile specimens of *Gymnacranthera bancana*, also with a stout habit and tomentum remaining on the twig apex and the lower leaf surface, may be confused with the present species. However, in the former the hairs of the tomentum are much more interwoven forming a thin felty mat, whereas in *H. superba* the leaf undersurface is covered with harsh, stellate-dendroid hairs.

5. The fruits are recorded by Sinclair (1958, p. 395) as being as large as 7-9 × 5.5-6.8 cm, and at first covered with harsh rusty scurf, becoming glabrous. In the material at my disposal the fruits are all smaller and glabrous, consistent with the glabrous ovary, and I assume that Sinclair's description was probably based on a mixture of species.

55. *Horsfieldia sessilifolia* de Wilde, *sp. nov*

Horsfieldia species *H. sylvestris* similis, ab ea differt folius maioribus, c. 50 × 14 cm, dense breviter

tomentosis ad folia paginam inferiorem, petiolo brevissimo ac lato, usque ad c. 3 mm longo, perianthio 3-valvato, usque ad $\frac{1}{2}$ divisio, ovario subglabro. — Type: Turkey bin Tran S 27808 (L; iso: K, SING, Silvic. Sib. n.v.).

Tree c. 30 m. Twigs terete, stout, towards the apex c. 8-10(-20) mm diam.; twig apex (and leaf bud) not seen; bark lower down glabrous, finely striate and rather densely set with conspicuous lenticels. Leaves arranged in 2 rows, chartaceous, oblong-lanceolate, \pm parallel-sided, c. 50×14 cm, base broadly rounded to subcordate, top acute-acuminate; upper surface drying dark brown, glabrous, lower surface finely bright-brown pubescent with densely interwoven hairs c. 0.1(-0.3) mm; without dark brown dots; midrib above flattish; nerves c. 30(-35) pairs, above flat or slightly sunken, beneath with distinct submarginal arches; tertiary venation forming a coarse network, indistinct, on the lower leaf surface and largely hidden by the tomentum; petiole short, c. 2.3×8 mm, or leaves sessile; leaf bud not seen. Inflorescences only known in ♀: c. 3 times ramified, c. 4.5×3.5 cm, rather many-flowered; branches rather densely rusty woolly-pubescent with hairs c. 0.3-0.5 mm; common peduncle c. 1×0.8 cm; bracts oblong-lanceolate, c. 1 cm long, inside subglabrous, outside pubescent as the inflorescence, caducous. Flowers in ♀ in clusters of 2-5 each; perianths 3-valved, minutely pubescent in the lower half. Male perianth not seen. Female perianth obovoid-ellipsoid, stout, c. $4.5-5.0 \times 4.0-4.5$ mm, coriaceous, pubescent with hairs c. 0.1 mm in the lower half, cleft at anthesis to c. $\frac{1}{8}-\frac{1}{10}$ only, valves c. 0.5 mm thick; pedicel stout, c. 1 mm long, minutely pubescent; ovary ovoid, c. 2.5×2.5 mm, subglabrous, with a few minute hairs, only on and near the base of the suture, whitish, less than 0.1 mm long; stigma broadly 2-lipped, c. $0.2-0.3 \times 1.5$ mm, not or only faintly lobed. Fruits not seen.

Distribution. Borneo. Sarawak: Sibu district (3rd Div.), known only from the type from Sg. Tutus, Loba Kabang (S) P.F., Batang Igan.

Ecology. Lowland mixed swamp forest, apparently under 100 m alt. Flowers in June.

Vernacular name. Kumpang tembaga.

NOTES

1. *Fieldnotes.* Recorded as a tree 100 ft. tall, 42 ins. girth, with stilt roots.

2. The specimen on which the new species is based is reminiscent of some other stout-leaved *Horsfieldias*, viz. *H. sylvestris* from SE. Malesia, and to a lesser extent of *H. splendida* (Borneo), *H. superba* (Malaya, Sumatra), or *H. pulcherrima* (Sumatra), but the present new species is distinct in its almost sessile leaves and the densely short-pubescent lower leaf surface. *H. sylvestris* is generally less stout; it has similarly subsessile (but narrower) leaves and 2-valved perianths. The other mentioned stout-leaved species all have the leaves distinctly petioled.

3. The specimen was collected in June, 1971, i.e., after Sinclair's work was published. In the absence of male flowers, Mr. J. Koster (Koster & Baas, 1981) investigated the leaf anatomy and confirmed the identity of the specimen as being a *Horsfieldia*.

56. *Horsfieldia grandis* (Hook. f.) Warb.

Fig. 1C(56)

Myristica grandis Hook. f., Trans. Linn. Soc. 23 (1860) 157 — *Horsfieldia grandis* (Hook. f.) Warb., Mon. Myrist. (1897) 301; Sinclair, Gard. Bull. Sing. 16 (1958) 400, f. 39; 28 (1975) 48. — Type: Sabah, *Low s.n.* (K).

Myristica rubiginosa King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 302, pl. 130 — Type: Singapore, *King's Coll. 1233* (CAL, n.v.; iso: K, L).

Tree 6-25 m. Twigs stoutish, terete, towards the top (3-)4-10 mm diam., late-glabrescent, tomentum dense, harsh, with hairs c. 1.0-1.5 mm long; bark of twigs lower down rather coarsely striate, when older longitudinally and sometimes slightly transversely cracking, hence slightly flaking; lenticels often present, somewhat elongate, not conspicuous. Leaves in 2 rows, membranous or chartaceous, somewhat bullate, elliptic-oblong to oblong-oblancheolate, broadest usually somewhat above the middle, 12-40 × 5.20 cm, base ± attenuate to subcordate, top acute or acute-acuminate; upper surface drying olivaceous to dark brown, minutely paler pustulate, largely with harsh, persistent tomentum of rather distant hairs, sometimes glabrescent, but always scabrous from harsh, persistent hair-bases, lower surface with persistent tomentum of dense to rather distant hairs c. 1.0-2.0 mm long, harsh-woolly to the touch; without brown dots; midrib above usually densely pubescent, somewhat raised; nerves (8-)10-16(-19) pairs, above flattish or usually sunk, the marginal arches distinct; tertiary venation forming a lax network, well visible on both surfaces especially the lower; petiole 6-15 × 2.5-6 mm, densely pubescent; leaf bud short-conical, densely pubescent, 7-15 mm long. Inflorescences densely pubescent, hairs yellow-rusty, 1.5-3.0 mm long, in ♂: many-flowered, 3 or 4 times ramified, usually rather lax, c. 6-25 × 2.5-10(-15) cm, common peduncle up to 12 mm long; ♀ inflorescences 1.5-5 cm long, the flowers often of different age and size; bracts generally oblong to lanceolate-linear, (1.0) 3-12 mm long, caduous. Flowers 3- or 4-valved, glabrous, solitary or usually in loose clusters, often aggregated into compound clusters corresponding to the main ramifications of the inflorescences; pedicels slender, glabrous, at base inarticulate. Male perianth globose or depressed-globose, 1.2-1.8(-2.0) mm diam, at apex rounded or broadly rounded, base rounded; pedicel (0.5-)1-2 mm long; perianth at anthesis cleft to c. 1/3 to nearly 1/2-way, valves c. 0.2 mm thick. Androecium depressed globose, not laterally compressed, apex broadly rounded to depressed, c. 0.5-1.0 × 0.8-1.5 mm; anthers 8-10, almost completely sessile, incurved towards the top, column broad, solid, hollow c. 0.2 mm deep; androphore rather narrow, 0.2-0.4 mm long. Female perianth subglobose to broadly ellipsoid, 2.0-3.2 × 2.0-2.8 mm, cleft at anthesis to c. 1/4-1/3, valves 0.2-0.3 mm thick; pedicel 0.3-0.5 mm long, glabrous except sometimes with a few hairs at the base; ovary globose to broadly ellipsoid, c. 1.5-2.0 × 1.5-1.8 mm, glabrous, stigma sessile, faintly 2-lobed, c. 0.2 mm high. Fruits 2-10 per infructescence, ± clustered, obovoid-ellipsoid, top rounded 1.0-1.4 × 0.8-1.1 cm, glabrous, valves c. 1.5 mm thick, drying dark brown or reddish brown, without distinct lenticels, not warted; seed almost globose, 8-10 mm diam.; stalk c. 1 mm long; perianth persistent.

Distribution. Sumatra (Palembang; Riouw, *n.v.*), Malaya (Pahang, Johore), Singapore, Borneo (Sarawak, Brunei, Sabah, E. Kalimantan).

MALAYA. Pahang: *Chew Wee-lek & Noor, CWL 261* — Johore: *FRI 8699, 17135; Holttum 9304; Ridley 4827; SFN 36831; Shah, Noor & Shukor MS 2060; Sinclair 10602.*

SINGAPORE. *King's Coll. 1233; Ridley 4133; Sinclair 9363.*

SUMATRA. Palembang: *Enderi 44* — Riouw Arch.: *Teysmann s.n.* (not seen).

BORNEO. Sarawak: *Hose* 655; *S* 15006, 18940, 23057, 25486, 26257, 28966, 29189, 37731, 37952 — Brunei: *Ashton BRUN* 64, 752, 3011; *Fuchs & Muller* 21160; *Wyatt-Smith KFN*. 80106; *Sinclair & Kadim* 10455 — Sabah: *Castro A* 83; *SAN A* 1741, 3691, 17497, 36338, 36914, 44361, 44713, 48857 69297, 72199, 77512, 80921, 84636, 93684; *Sinclair, Kadim, & Kapis* 9249; *Wood* 9; *Wood* 1226 — E. Kalimantan: *Enderi* 5081; *Jaheri* 727; *Korthals* 92; *Kostermans* 7035, 7044.

Ecology. Primary and secondary forest, ridge forest; on sand and clay soil, sandstone; 0-600 m alt. Flowers and fruits throughout the year.

Vernacular names. Kumpang (Malay, Iban name; Sarawak); Penarahan (Brunei); Tjemanding (Sumatra, Palembang).

NOTES

1. *Fieldnotes.* Slender tree, without buttresses; monopodial branches, branchlets few, horizontal. Bark sometimes recorded as smooth, non-flaking, usually as longitudinally fissured, or scaly, or flaky, or cracked; strips c. 1 mm thick, c. 1 cm wide, hard and thin; inner bark c. 2-3 mm thick, slash rich red-brown, with reddish watery exudate. Sapwood soft, whitish to yellowish pink, wood pale brown. Flowers yellow, with faint odour. Fruits yellow-green, yellow or \pm orange, pericarp inside pink; aril orange; seed pale grey.

2. Perianths are usually 4-, less frequently 3-valved. I think there are 8-10 anthers, but Sinclair says 13-15, the discrepancy is probably caused by the thecae being tightly appressed and difficult to count.

3. The fruits are small, rather contrasting with the stout habit of twigs and leaves. The perianth remains persistent under the maturing fruit.

4. The circumscription of the present species is the same as that by Sinclair. It belongs apparently to the group of West-Malesian species with pubescent lower leaf-surface, and is probably most closely related to *H. flocculosa*. *H. grandis* is well-marked in many details and readily recognizable by the scabrous upper leaf surface which is caused by the harsh hair-bases.

57. *Horsfieldia wallichii* (Hook. f. & Th.) Warb.

Fig. 1C(57)

Myristica wallichii Hook. f. & Th., Fl. Inc. (1855) 161 (p.p., Wall. Cat. 6806 being a mixture, see note by Sinclair, loc. cit., p. 158); A. DC., Prod. 14, 1 (1856) 230; Miq., Fl. Ind Bat. 1 (2), 1 (1858) 67; Hook. f., Fl. Br. Ind. 5 (1886) 105; King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 303, pl. 132 & 133, excl. syn. *M. crassifolia* Hook. f. & Th. — *M. horsfieldia* auct. non Bl.: Wall. Cat. (1832) 6806, p.p. — *Horsfieldia wallichii* (Hook. f. & Th.) Warb., Mon. Myrist. (1897) 305; Sinclair, Gard. Bull. Sing. 16 (1958) 405, fig. 41, pl. XI A; 28 (1975) 156 (p.p. excl., part of the Bornean material = *H. borneensis*) — Syntype: Malacca, *Griffith s.n.* (K); Singapore, *Wallich Cat*, 6806, p.p. (CAL *n.v.*; K); *Lobb s.n.* (K, *n.v.*).

Tree, 10-30 m. Twigs terete or drying somewhat flattened, usually conspicuously hollow, towards apex 3-6(-9) mm diam., early to late-glabrescent from tomentum of hairs c. 0.3-0.6 mm, bark lower down usually dark brown or blackish, coarsely striate, with or without inconspicuous lenticels; bark on older twigs often longitudinally fissured, sometimes flaking. Leaves in 2 rows, membranous to coriaceous, ovate-oblong to oblong-lanceolate, broadest usually at about the middle or somewhat parallel-sided, (14-)19-40 \times (4-)4.5-12 cm, base rounded to short-attenuate,

top subobtusate to acute-acuminate; upper surface drying olivaceous to blackish-brown, glabrous (with minute tomentum remaining on the midrib or not); lower surface late-glabrescent or tomentum locally persisting, of rather spaced to dense dendroid hairs (0.3-)0.5-0.8 mm long, always provided with typical scattered brown-black dots and stripes of irregular sizes; midrib above flat or slightly raised, late glabrescent; nerves (12-1) 15-28 pairs, above very slender, flat or sunken; tertiary venation forming a lax network, usually indistinct or invisible, petioles relatively long, $15-35 \times 2.5-4.5$ mm, glabrescent; leaf bud c. $20-30 \times 4-6$ mm, densely pubescent, hairs c. 0.3-0.6 mm. Inflorescences usually behind the leaves, moderately to densely pubescent with stellate-dendroid hairs 0.5-1.0 mm long, in ♂: large, many-flowered, 3 or 4 times ramified, $10-33 \times 6-22$ cm, common peduncle 30-70 mm, in ♀: stoutish, fewer-flowered, c. 3-7 cm long; bracts broadly ovate, 3-10 mm long, densely woolly-pubescent, caducous. Flowers in ♂ in clusters of 5-12, perianth 3-(or 4)-valved, glabrous, or in ♀ glabrescent, pedicel short, pubescent, at base inarticulate. Male perianth broadly obovoid, $2-2.5(-3.0) \times 2.4-2.5(-3.0)$ mm, top broadly rounded, base \pm attenuate, glabrous; pedicel short, 0.3-0.6 (-1.0) mm, pubescent with hairs 0.2-0.3 mm long; perianth at anthesis cleft to c. $\frac{1}{3}-\frac{2}{3}$; valves c. 0.2-0.3 mm thick. Androeceum broadly obovoid to subglobose, above \pm depressed with a tri-radiate crack, based rounded to attenuate, faintly 3-angular in cross-section, $1.3-2.0 \times 1.5-2.0$ mm; anthers (12?-)15-23, completely connate, sessile and closely appressed, at apex rather deeply incurved into the broad hollow c. $\frac{1}{2}$ -way deep in the column; androphore short and narrow, up to 0.3 mm long. Female perianth ovoid-ellipsoid, $2.5-4.0 \times 2.0-3.5$ mm, glabrescent from hairs 0.1 mm, cleft at anthesis to c. $\frac{1}{3}$, valves c. 0.5 mm thick; ovary ovoid to subglobose, $2.0 \times 2.0-2.5$ mm, glabrous, stigma rather broad, faintly 2-lobed, c. 0.3×0.8 mm; pedicel stout, 0.5-1.5 mm long, densely pubescent by hairs 0.2-0.3 mm. Fruits 2-9 per infructescence, ovoid-ellipsoid, top and base rounded, $4.0-6.0 \times 3.0-4.5$ cm, glabrous, drying dark brown, smooth or wrinkled, not or only faintly warted, valves 10-15 mm thick; stalk stout, 4-6 mm long; perianth generally persistent under the fruit.

Distribution. Malaya (all provinces except Perlis and Negri Sembilan), Singapore, Sumatra (Aceh, Tapanuli, W. & E. Coast, Indragiri, Djambi, Palembang; Simalur (Simeuluë), Morsala, Mentawai Isl., Bangka), Borneo.

MALAYA. *FR10514*, 2135, 4565, 6703, 13252, 14675, 14771, 17076; *Kep. FN.* 94671, 99010; *Kunstler (King's Coll.)* 4827; *Maingay* 2665; *Scortechini* 246a; *SFN* 40484; *Sinclair* 9984.

SINGAPORE. *Maingay* 1001, 1001A, 1283, 1284; *SFN.* 33556, 34439, 39486, 39487, 40216; *Wallich Cat.* 6806.

SUMATRA. *Achmad* 251, 514, 675, 1219; *b.b.* *T* 944, 16382, 17452, 19346, 24049, 30033, 31758, 32146; *Forbes* 3048, 3078; *Kostermans* 205 (*b.b.* 34139), *b.b.* 34063, *b.b.* 34194; *Kostermans & Anta* 795, 845, 1068, 1194; *Krukoff* 4114; *Mochtar* 62A, 82A, 91A 97A; *de Wilde & de Wilde-Duyffjes* 18931.

BORNEO. Sarawak: *Haviland* 2182 — Sabah: *B&N* For. Dept. 1682 — Kalimantan, West: *b.b.* 25505; E. and SE.: *b.b.* 16139, 21179; *Forman* 484; *Kostermans* 5651; *Leighton* 844; *Hubert Winkler* 2419.

Ecology. Lowland forest, on 'red' soil, granitic sand soil, loam soil with coral limestone; ridge-top forest; 0-470m. Flowers and fruits throughout the year.

Vernacular names. Asem-asem (Bangka, Malay), Piangu, Pijangu (Bangka, Malay); Satim, Soemarallah-falah, Soemarallah-oeding, Toetoen soemarallah dč-lok (all Simeuluë Isls.).

NOTES

1. *Fieldnotes*. Bole straight; crown dense, monopodial. Bark shallowly or deeply longitudinally fissured, dark grey, not flaking. Bark c 1 cm. thick, slash under bark bright red, pink, reddish brown, or deep red; slash wood whitish, pale or dirty yellowish, light brown, brown or red-brown. Flower buds blue-green or yellow at anthesis. Fruits glaucous, turning green-yellow, yellow, orange, orange-yellow, or red; aril orange.

2. This species is identical with Sinclair's circumscription of the species for the Malay Peninsula (Sinclair, 1958), but if compared to Sinclair's, 1975, the majority of the specimens from Borneo should be excluded. These specimens are presently described as a new species *H. borneensis*.

3. *H. wallichii* is, in the sterile state, always recognizable by the blackish dots and stripes scattered on the lower leaf surface. Similar dots are only found in a few other species, incl. *H. borneensis*, but the latter differs in general habit and the male flowers; it has almost similar fruits.

H. wallichii in the sterile and fruiting state can also be confused with *H. superba*, a large-leaved species, but this lacks the blackish markings on the lower leaf surface. *H. motleyi* has also somewhat similar leaves, i.e., drying dull above, and with flat or sunken lateral nerves; apart from the difference in the flowers and fruits, its lower leaf surface is not dotted.

58. *Horsfieldia pulcherrima* de Wilde, *sp. nov.*

Fig. 1C(58)

Ramuli robusti, tarde glabrescentes, pilis 1-1.5mm longis. Folia 24-36 cm longa, subtus pubescentia atque munita punctis sordide brunneis non-traumaticis. Perianthium masculum depresso-globosum, 1-1.3 mm diam., 3-valvatum, glabrum, pedicello basi non-articulato. Androecium depresso-globosum, 0.8-1.0 mm diam., anthers 12. — Type: Malaya, *Cockburn FRI 8008* (L: iso: K).

Tree 7-27 m. Twigs stout, terete, towards apex 5-8(-14) mm diam., densely felty to woolly pubescent with rusty or reddish brown hairs c. 1.0-1.5 mm, late glabrescent, bark coarsely striate, when older somewhat cracking and flaking; lenticels only in the older wood, large, not contrasting in colour. Leaves in 2 rows, chartaceous, elliptic-oblong to oblong, broadest usually at about the middle, (18-)24-36 × 8-14 cm, base rounded to attenuate, top acute-acuminate; upper surface drying dull olivaceous brown to blackish brown, glabrous (glabrescent, and not scabrous), lower surface with dense rusty or red-brown tomentum of mostly dendroid hairs 1.0-1.5 mm long and with scattered dark brown to blackish ± wart-like marks (cork warts); midrib above rather slender, late-glabrescent, flat; nerves 18-23 pairs, above slender, flat to sunken, marginal arches not very distinct; tertiary venation forming a rather lax network, usually faint or scarcely visible; petiole 15-25 × 5-7 mm, pubescent; leaf bud c. 25-30 × 7-9 mm, with hairs 1-1.5 mm long. Inflorescences behind the leaves, densely woolly-pubescent with ± shaggy hairs 0.5-1.5 mm long, in ♂: 5-8 × 5 cm, many-flowered, 3 or 4 times ramified, common peduncle 2-10 mm long; in ♀ a short, irregularly shaped, woody knob (as in some *Knemas*), c. 1 cm long. Flowers subsolitary or in loose clusters of up to 15 each, 3-(or 4-)valved, glabrous; pedicels glabrous, at base inarticulate; bracts ovate-oblong, acute, densely pubescent outside, 3-7 mm long, caduous. Male perianth somewhat depressed-globose, c. 1.0 × 1.2-1.3(-1.4) mm, top ± depressed or broadly rounded, base rounded, pedicel 1-1.5 mm long, slender, not tapered; perianth at anthesis

cleft to c. $\frac{1}{3}$ to nearly $\frac{1}{2}$ -way, valves c. 0.2 mm thick. Androecium depressed-globose, above \pm depressed and with a 3-(or 4-)radiate crack, $0.5-0.6 \times 0.8-1.0$ mm; anthers 12 or 13 (c. 24 thecae), mutually closely pressed, completely sessile, the apical parts overarching the apical hollow to c. $\frac{1}{2}$ -way deep; column broadly saucer-shaped, androphore narrow, 0.1-0.2(-0.3) mm long, largely hidden by the anthers. Female perianth (as known from caducous remnants under fruit): c. 3 mm long, sparingly pubescent with hairs c. 0.3 mm long, at anthesis cleft to nearly $\frac{1}{2}$ -way, valves c. 0.3 mm thick. Ovary pubescent. Fruits in clusters of 1-3 per infructescence, broadly ellipsoid to globose, c. $1.6-1.8 \times 1.5-1.7$ cm, densely shaggy rusty pubescent with hairs c. 2 mm long, valves \pm woody, c. 1.5 mm thick, seed broadly ellipsoid, c. 10 mm long, aril entire, completely enveloping the seed; stalk 0-1 mm; perianth not persistent.

Distribution. Malaya (Pahang, Johore), Sumatra (Jambi).

MALAYA: FRI 8008, 19881, 31807; Kep. 104997, 110369.

SUMATRA: Roos & Franken TFB 1983 (sterile).

Ecology. Lowland primary forest, swamp forest; 50-600 m alt.; apparently a rare species. Flowers in March, fruits in June and September.

NOTES

1. *Fieldnotes.* Slender tree, crown monopodial. Bole straight; bark grey-brown to blackish, shallowly fissured, occasionally flaking. Inner bark red, laminated, with some red exudate. Slash wood whitish to pale yellow, wood brown. Immature flowers green. Fruits yellowish-brown hairy.

2. All the specimens of this remarkable and beautiful new species known to me were collected after Sinclair's revision of *Horsfieldia*. In sterile state the species may be confused with *H. superba*, *H. flocculosa*, or *H. wallichii*, but its σ flowers are quite different, rather resembling those of *H. grandis*. The species is peculiar because of its smallish, subglobose, densely tomentose fruits. In all related species the fruits (and ovary) are glabrous.

3. If sterile, *H. pulcherrina* may superficially resemble and be confused with the stout-leaved *Gymnacranthera bancana*, but the latter has a different tomentum, and lacks the blackish dots on the lower leaf surface.

59. *Horsfieldia flocculosa* (King) Warb.

Fig. 1C(59)

Myristica flocculosa King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 302, pl. 131 — *Horsfieldia flocculosa* (king) Warb., Mon. Myrist. (1897) 297; Sinclair, Gard. Bull. Sing. 16 (1958) 398, f. 38. — Type: Malaya, Selangor, King's Coll. 8618 (CAL. n.v.; iso: BM. K. L. P; B⁺, Fl. G, KEP, Z, n.v.).

Tree 10-28 m. Twigs stout, terete, towards the apex 6-10(-12) mm diam., densely felty-woolly pubescent with yellow brown or pale brown hairs (1.0-) 1.5-2 mm, late glabrescent, bark coarsely striate, soon longitudinally cracking, in older wood also transversely cracking and \pm flaking; lenticels absent or indistinct. Leaves in 2 rows, chartaceous, oblong to oblong-lanceolate, broadest at about the middle, 18-40(-45) \times 6-13(-18) cm, base broadly to narrowly rounded or subcordate, tip acute-acuminate; upper surface drying usually olivaceous to (light) brown, finely pust-

late and wrinkled, glabrous, not scabrous, lower surface with dense persistent woolly tomentum of hairs 1.5-2 mm long, without blackish dots; midrib flat above; nerves 15-20 pairs, above sunken, marginal arches rather distinct and regularly shaped; tertiary venation forming a lax network, \pm faint above, on lower surface much obscured by the tomentum; petiole 7-14(-20) \times 5-7 mm, densely pubescent; leaf bud stout, 10-15 mm long. Inflorescences behind the leaves, densely woolly-pubescent, in σ : rather stout, many-flowered, 3 or 4 times ramified, (8-) 12-20 \times 5-14 cm, common peduncle stout, 3-5 mm diam., 1-10 mm long; in ϕ : little ramified, 1.5-3 cm long, rather few-flowered. Flowers solitary or 2-3(-4) together, generally not clustered, glabrous, (3- or) 4-valved in σ , (2- or) 3-valved in ϕ ; pedicels at base inarticulate, glabrous; bracts ovate to lanceolate, densely pubescent, 5-20 mm long, caducous. Male perianths broadly ellipsoid to obovoid, or sometimes subglobose, not or slightly laterally compressed, (2.0-) 2.2-3.0 \times 2.0-2.7 mm, top broadly rounded, base rounded, pedicel slender, not tapered, (1.5-) 3.0-4.0 mm long; perianth at anthesis cleft to $\frac{1}{5}$ - $\frac{1}{4}$, valves c. 0.2 mm thick. Androecium \pm ellipsoid or broadly obovoid, subtruncate, c. 1.2-1.5(-2.0) \times 1.0-1.3(-1.5) mm, not or only little laterally compressed, base broadly rounded, often faintly 4-angular in transverse section; anthers 10-13 entirely sessile, (not? septate), the apices slightly curved into the shallow hollow, c. 0.2-0.3 mm deep in the apex of the broad and solid column; androphore short, c. 0.1 \times 0.4 mm, usually hidden by the slightly sagged anthers. Female perianth broadly ellipsoid, c. 3.5 \times 3.0 mm, cleft at anthesis to c. $\frac{1}{6}$ - $\frac{1}{5}$, valves c. 0.4-0.5 mm thick; pedicel stoutish, c. 2 mm long, glabrous; ovary broadly ovoid, c. 1.8 \times 2.0 mm, glabrous except for a few minute hairs (always?) on the suture below the stigma, stigma minute, faintly 2-lobed, c. 0.3 mm long. Fruits (almost mature, according to Sinclair) subglobose to slightly ellipsoid, glabrous, c. 3.0 \times 2.5 cm, pericarp c. 5 mm thick; stalk 5 mm long; perianth (at first) persistent.

Distribution. Malaya: Only seen from Selangor, Negri Sembilan, Pahang and Johore.

MALAYA. (Whitmore) FRI 0048; Hassan & Kadim H. 98; Kep. 104653, 110225, 77746; King's Coll. 8618; SFN 16394, 32314.

Ecology. Lowland rain forest, also swampy forest, regenerated forest; 0-300 m alt. Flowers mainly February-June.

NOTES

1. *Fieldnotes.* Buttresses absent. Bark distantly superficially fissured, blackish brown; inner bark pinkish brown, laminated; sapwood whitish. Exudate watery, red. Young leaves flocculose. Margins of leaves slightly revolute when dry. Leaves somewhat bullate, thickish, shiny medium green above, golden below. Flowers yellow, or waxy light yellow. The perianths are described by Sinclair (1958, p. 400) as 'covered with circles which are hyaline in the centre and brown round the circumference'.

2. Apparently much related to *H. superba*, *H. fulva* (the ϕ flowers \pm similarly shaped as the σ), and also to the group of *H. grandis*, and others but is distinguished by many characters. The species is presently accepted in the same sense as by Sinclair and earlier authors.

60. *Horsfieldia motleyi* Warb.

Fig. 1C(60)

Horsfieldia motleyi Warb., Mon. Myrist. (1897) 304; Merr., En. Born. J. Str. Br. R. As. Soc. spec. number (1921) 268; Sinclair, Gard. Bull. Sing. 28 (1975) 81 — *Myristica motleyi* (Warb.) Boerl., Handl. Fl. Ned. Ind. (1900) 85. — Type: SE. Borneo, Banjarmasin, *Motley* 355 (K, iso. CGE, *n.v.*).

Horsfieldia macrobotrys Merr., Pl. Elm. Born. in Univ. Cal. Publ. Bot. 15 (1929) 76 — Type: Sabah, Tawau, Elmer 21882 (PNH, †; iso: BM, K, L; BO, SING, and others not seen).

Tree 12-35 m. Twigs terete, towards the apex (2.5-)3-5(-10) mm diam., late-glabrescent from dense rusty tomentum of hairs c. 0.5(-1.0) mm, bark lower down finely striate; lenticels not conspicuous; bark of older twigs not flaking. Leaves in 2 rows, membranous, not bullate, elliptic to oblong, broadest usually at about the middle, 9-27 × 4-12 cm, base rounded to attenuate, top obtusish to acute-acuminate; upper surface drying dull dark-olivaceous to greenish brown, glabrous, lower surface with persistent rather dense tomentum of stellate-dendroid hairs of mixed size, c. 0.3-1.0 mm long, without larger blackish dots; midrib flattish above, sometimes late-glabrescent; nerves 9-21 pairs, slender above, often late-glabrescent, flat or usually sunken, the lateral arches not very distinct; tertiary venation forming a lax network, faint above; petioles 13-22 × 1.5-4 mm, rather late-glabrescent; leaf bud c. 15-20 × 3-4 mm, densely pubescent by hairs c. 0.5 mm long. Inflorescences densely pubescent with stellate-dendroid yellow-brown to rusty hairs c. 0.5-1.0 mm long, in ♂: 4 or 5 times ramified, many-flowered, 12-20 × 10-14 cm, common peduncle 20-40 mm, the flowers before maturity often densely clustered and in submature buds often ± angular; in ♀: much ramified, rather many-flowered, 3-6(-10) cm long; bracts densely pubescent, broadly ellipsoid, acutish, 2-5 mm long. Flowers in clusters of 5-20, 3-valved, perianth and pedicel pubescent by hairs 0.1-0.3 mm, the pedicels slender, at base inarticulate. Male perianth subglobose or broadly obovoid, 0.8-1.0 × 0.7-1.0(-1.1) mm, top broadly rounded, base rounded, pubescent or late-glabrescent; pedicel slender, 1-1.5 mm long; perianth at anthesis cleft to c. half-way; valves c. 0.1 mm thick. Androecium (incl. androphore) broadly obovoid, above somewhat flattish and depressed in the centre, sub-circular in transverse section, 0.5-0.7 × (0.3-)0.5-0.6 mm; anthers 5, almost completely sessile, towards the top not or hardly incurved, 0.25-0.4 mm long; column broad, solid except for the shallow, broad, apical hollow to c. 1/10; androphore conspicuous, about as long as the anthers, broad, tapering, c. 0.2-0.3 mm long, continuous with the anthers. Female perianth ellipsoid, c. 2.4 × 1.8-2.0 mm, pubescent, cleft at anthesis to c. 1/4-1/3, valves c. 0.2 mm thick; pedicel c. 1.5 mm long; ovary broadly ellipsoid, 1.5 × 1.2 mm, top and base broadly rounded, conspicuously grooved at one side, glabrous, stigma broad, shallowly 2-lobed, c. 0.2 mm high. Fruits 5-15 per infructescence, broadly ellipsoid, top and base rounded, 1.9-2.3 × 1.6-1.8 cm, glabrous, drying brown, without lenticel-like wartlets, dry valves c. 2 mm thick; stalk 2-4 mm long; perianth not persistent under mature fruit.

Distribution. Whole of Borneo: Sarawak, Sabah, W., S., SE. and E. Kalimantan.

BORNEO. Sarawak: *S (Chai)* 36774, (*Martin*) 37945 — Sabah: *Elmer* 12882; *San.* 19007, 27443, 29966, 77428 — Kalimantan, West: *Hallier* 347 — South: *Kostermans* 8117 — SE.: *b.b.* 18449, 26178; *Korthals* (39); *Motley* 355 — East: *Kostermans* 4864, 6859, 10428.

Ecology. Primary forest, disturbed forest, poor forest, Dryobalanops forest, or hill Dipterocarp forest, usually on dry sandy soils, sandy clay, also loam with lime; often on ridge tops; 0-600 m alt. Flowers and fruits throughout the year.

NOTES

1. *Fieldnotes*. Bole sometimes with steep buttresses to 5 m high, c. 30 cm out, c. 9 cm thick, merging into the stem. Bark usually distinctly fissured, often scaly, strips 3-4 cm wide, to c. 10 mm thick, dark brown, black-brown, chocolate, or red-brown; living bark 10-12 mm thick, undulate in cross section, dark brown, or brown-red, inner bark red-laminated; cambium pinkish. Sapwood whitish, reddish white, heartwood reddish or pinkish or brown; exudate of bark a red watery latex, sometimes recorded as sticky, appearing fast. Flowers (dark) yellow. Fruits orange-red, with sticky exudate; aril reddish.

2. In Sinclair's conception this species contains a number of specimens which are in the present revision regarded as a different species, *H. affinis*. The latter differs in many characters, such as the pedicel being articulate at base, a differently shaped androecium, a larger glabrous perianth, a different tomentum on the lower leaf surface, the perianth being persistent under the fruit, etc.

3. *H. motleyi*, especially in a young stage, may be confused with *Endocomia rufirachis*, formerly *Horsfieldia macrocoma* var. *rufirachis*, a species also with pubescent flowers.

61. *Horsfieldia tomentosa* Warb.

Fig. 1C(61)

Horsfieldia tomentosa Warb., Mon. Myrist. (1897) 302; Sinclair, Gard. Bull. Sing. 16 (1958) 403, fig. 40; 28 (1975) 149 — *Myristica tomentosa* Hook. f. & Th., Fl. Ind. (1855) 161, nom. illeg., not of Thunberg (1782); A. DC., Prod. 14, 1 (1856) 204; Miq., Fl. Ind. Bat. 1 (2), 1 (1858) 68; Hook. f., Fl. Br. Ind. 5 (1886) 105; King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 301, pl. 129 — Type: *Wallich Cat.* 9025 ("Myristicea?") (K-Wall.; iso: K, BM; CAL, G, SING, n.v.).

Tree 5-20(-40) m. Twigs terete, towards apex 2-5(-10) mm diam., late-grabescent from dense, rusty tomentum of woolly hairs c. 1.0-1.5 mm, bark of older twigs striate, not flaking; lenticels usually abundant, rather conspicuous. Leaves in 2 rows, membranous, elliptic or obovate to oblong-lanceolate, broadest at \pm or slightly above the middle, 9-27 \times 4-10(-12) cm, base nearly rounded to attenuate, tip acute-acuminate; upper surface drying brown, faintly minutely pustulate or not, glabrous or glabrescent, lower surface with persistent tomentum of dense dendroid hairs all of about the same size, c. 0.1-0.8 mm long, without blackish larger dots; midrib above flattish, glabrescent; nerves 7-15 pairs, flattish or sunk above, the marginal arches on lower surface rather distinct, rather regular of shape; tertiary venation forming a lax network usually indistinct or invisible above; petiole 10-18 \times 1.5-3 mm, densely pubescent; leaf bud narrowly ovoid-ellipsoid, c. 1-1.5 cm long, densely pubescent with hairs c. 1.5 mm. Inflorescences densely pubescent with woolly hairs 1.5-2.0 mm long, in σ : rather many-flowered, 3 or 4 times ramified, 3-12 \times 1.5-7 cm, common peduncle 3-23 mm; in ρ : \pm few-flowered, 2-6 cm long; bracts elliptic, densely woolly pubescent, 2-4 mm long, caducous. Flowers in small fascicles, 3-(or 4- or 5-) valved, glabrous; pedicels slender, at base not articulated, in σ glabrous, in ρ late-glabrescent, hairs c. 0.2 mm. Male perianth globose, 1.4-2.5 mm diam., base and apex rounded; pedicels 1-3 mm long; perianth at anthesis cleft to nearly $\frac{1}{2}$ -way, valves c. 0.1 mm thick. Androecium much-depressed globose, above flattish or usually impressed in the centre, circular to blunt-triangular in transverse section, 0.6-0.9 \times 1.2-1.7 mm; anthers 9-12(-15?), almost completely sessile, incurved towards the top; column broad, solid except for apical hollow c. 0.2 mm deep; androphore rather narrow, c. 0.4-0.5 mm long. Female perianths broadly ellipsoid, c. 2.5 \times 2.3 mm, cleft at anthesis to c. $\frac{1}{3}$,

valves c. 0.2 mm thick; pedicel 1-2 mm long, late-glabrescent; ovary subglobose, c. 1.5 mm diam., appressed-pubescent by hairs 0.1-0.2 mm, stigma minute, faintly 2-lobed, c. 0.1 mm long. Fruits 1-5 per infructescence, ellipsoid, top and base rounded, 1.5-2.0 × 1.3-1.6 cm, glabrescent, usually with minute tomentum remaining towards the base, drying dark brown, without lenticels but usually minutely pustulate, dry valves c. 1.5 mm thick; stalk 2-6 mm; perianth not persisting.

Distribution. S. Peninsular Thailand, Malaya (Kedah, Penang, Perak, Trengganu, Pahang, Selangor, Malacca, Johore, Kelantan), Singapore (doubtful, see Sinclair, l.c. p. 150), Sumatra (E. Coast, *fide* Sinclair; no specimens seen).

THAILAND. S. Peninsular: *Geesink* 7229, *A.F.G. Kerr* 17252, 17482; *Phusomsaeng* 142, 424 (*BKF* 51976); *Smitinand* 10378.

MALAYA. *Cantley* 30; *Cuning* 1846; *Curtis* 1197, 1748; *Derry* 967; *FRI* 0880, 3408, 15957, 16300, 25099; *Gaudichaud s.n.*, 44; *Hb. Hooker s.n.*; *KEP* 94965, 98507, 99205, 99403, 104304; *King's Coll.* 4165, 5671, 6102, 8532, 8642, 10557; *Shah (& Noor) MS.* 1319, 1536, 1864; *Phillips s.n.*; *Ridley s.n.*, 44, 7205, 10240; *SFN* 1082, 21751, 35134; *Sinclair* 9878, 10158; *Unesco Limestone Exp.* 159; *Wall. Cat.* 9025.

Ecology. Lowland and foot hill forest, in S. Thailand in evergreen forest, old secondary forest; 0-300 m alt. Flowers mostly in March, fruits mostly in July.

NOTES

1. *Fieldnotes.* Small or moderate, sometimes big tree to c. 40 m. alt. Bark recorded as fissured, not flaky or scaly, brown to blackish, soft. Inner bark pale reddish or pale yellowish, laminated, fibrous; exudate pink-red; sapwood whitish or pink. Flowers yellow, with a fine perfume. Fruits yellow to orange, aril red; perianth persistent in fruit.

2. The lobes of the male perianths in fully mature flowers are often slightly outward recurved.

3. *H. tomentosa* is in the present revision accepted in the same sense as by Sinclair and earlier authors. It belongs in the alliance with *H. grandis*, *H. flocculosa*, *H. motleyi*.

4. The name *tomentosa* should be attributed to Warburg because *Myristica tomentosa* Hook. f. and Thoms. is illegitimate; being a later homonym.

62. *Horsfieldia gracilis* de Wilde, *sp. nov.*

Horsfieldia paucinervis Warburg differt habitu gracili, foliis tenuiter membranaceis, tomento persistente, nervis paribus 14-17, fructibus ellipsoideis, c. 1.5 cm longis, glabris, perianthio persistente. — Type: Sarawak, *Ilias Pai'e S* 16604 (L: iso: K: S. n.v.).

Tree c. 5 m. Twigs terete, towards the apex 1.5-2.5 mm diam., rather late glabrescent, tomentum light brown with stellate-dendroid hairs 0.3-0.5 mm, bark of older twigs striate, neither cracking nor flaking; lenticels minute and inconspicuous or absent. Leaves in 2 rows, thinly membranous, oblong-lanceolate, broadest at about or slightly above the middle, 12-21 × 4-6(-6.5) cm, base (rounded-) attenuate, tip acute-acuminate; upper surface drying dull olivaceous, glabrous, lower surface pale olivaceous-brownish, with subsistent tomentum consisting of scattered pale dendroid-stellate hairs 0.3(-0.5) mm; without larger brownish or blackish dots or marks; midrib raised above, beneath with persistent tomentum;

nerves 14-17 pairs, slightly raised to flat above, the marginal arches regularly shaped, slightly impressed and obvious; tertiary venation forming a lax network, indistinct; petiole $8-14 \times 1.5(-2)$ mm, late glabrescent; leaf bud c. $6-7 \times 1.5$ mm, densely pale-brown pubescent, with hairs 0.3-0.5 mm long. Male flowers not seen. Female inflorescences not or only once ramified, 2-5-flowered, 1-1.5 cm long, pubescent with hairs 0.3-0.5 mm long; bracts not seen. Female flowers 3-valved, glabrous, pedicel at base apparently inarticulate (male flowers not seen); perianth (persistent as judged from the fruit) c. 2.0×1.5 mm, at anthesis cleft to c. $\frac{1}{2}$ -way, valves c. 0.3 mm thick, glabrous; pedicel c. 1 mm long, glabrous; pistil not seen. Fruits 1-3 per infructescence, ellipsoid, top and base subobtuse, $1.4-1.5 \times 1.0-1.1$ cm, glabrous, drying dark brown, with a finely granulate structure, lenticel-like tubercles absent, dry valves 0.5-1.0 mm thick; stalk 1-1.5 mm; perianth persistent under the fruit.

Distribution. Borneo: Sarawak, Miri Dist., only known from the type.

Ecology. Primary lowland forest.

NOTES

1. This species is known only from the type collection, in fruit. It was recorded as a small tree, 15 feet high and 4 inches in girth, and identified by Sinclair as *Horsfieldia* sp. Although only the fruits are known, it is obvious from its general habit that the present new species belongs to the group of *H. paucinervis*, beside which it keys out. It is inferred that the male flowers have the following characteristics: inflorescences rather tiny, c. 6 cm long, pubescent with hairs c. 0.4 mm long; perianth subglobose (likely c. 1-1.5 mm diam.), 3-(or 4)-valved, splitting in bud to c. $\frac{1}{2}$ -way, glabrous; pedicel glabrous, at base inarticulate; androecium globose or depressed-globose, sessile or with a short androphore, in transverse section \pm circular, anthers largely sessile, the column at the apex with a shallow hollow.

Horsfieldia gracilis is readily recognized by its slender habit, thin membranous leaves and (sub)persistent though not very conspicuous, rough tomentum on the leaf bud, twig apex and lower leaf surface, especially on the midrib and nerves, and by the small fruits with a persistent perianth. Superficially the species may be taken for *H. tenuifolia* or *H. macilenta*.

63. *Horsfieldia paucinervis* Warb.

Fig. 1C(63)

Horsfieldia paucinervis Warb., Mon. Myrist. (1897) 345, t. 22; Merr., En. Born., J. Str. Br. R. As. Soc., spec. number (1921) 268; Sinclair, Gard. Bull. Sing. 28 (1975) 93 — *Myristica paucinervis* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3.1(1900) 87 — Type: Sarawak, Beccari 3279 (♀ fl.) (FI, n.v.).

Tree 3-8 m. Twigs terete, 2-3 mm diam., late glabrescent, tomentum reddish to yellow-rusty, of shaggy hairs 1.5-2 mm long, bark of older twigs dark grey, striate, not cracking; lenticels not conspicuous. Leaves in 2 rows, thinly chartaceous, not bullate, elliptic to elliptic-oblong, broadest at about the middle, $7-15 \times 3-6.5$ cm, base rounded to attenuate, tip acute to acute-acuminate; upper surface drying olivaceous to brown, glabrous, lower surface dull brown with persistent, thin tomentum of dendroid hairs of mixed sizes, c. 0.5-0.1 mm long; larger blackish dots or stripes present (always?); midrib flat above, indistinct, with persistent tomentum or late glabrescent; nerves 5-9 pairs, flat or sunken, the marginal arches indistinct;

tertiary venation very indistinct or invisible; petioles 6-12 × 1.5-2.5 mm, pubescent; leaf bud c. 8-10 × 3-4 mm, long pubescent. Inflorescences densely woolly pubescent with hairs (0.7-) 1.0-2.0 mm long, in ♂: many-flowered, 3 or 4 times ramified, 5-9 × 3-5 cm, common peduncle up to 15 mm long; in ♀: 4-6 cm long; bracts not seen, caducous. Flowers in ♂ in loose clusters, 3-valved, perianth glabrous, pedicels glabrous, at base inarticulate. Male perianth subglobose, 0.8-1.0 × 1.0-1.4 mm, top and base broadly rounded; pedicels slender, 0.5-1.0 mm long; perianth at anthesis cleft to c. 1/3 to nearly 1/2-way, valves c. 0.1 mm thick. Androecium small, ± depressed-globose, c. 0.3-0.5 × 0.4-0.8 mm, ± circular in transverse section (not 3-angled); anthers 4 or 5 (thecae 8 or 10), almost completely sessile, the tips incurved; column broad, solid except for a minute hollow at the top c. 1/5 deep, androphore narrow, somewhat tapering, c. 0.1-0.2 mm long. Female perianth (according to Warburg, Sinclair) ovoid-globose, c. 2.0 mm diam., cleft at anthesis to somewhat over 1/2-way; pedicel c. 2 mm long, glabrous; ovary subglobose, glabrous, stigma minute. Fruits (immature) with persistent perianth, oblong, glabrous, obtuse at both ends, c. 1.0 × 0.7 cm; stalk c. 2 mm long.

Distribution. Borneo: Sarawak (1st, 2nd, 4th Divisions).

BORNEO. Sarawak: Beccari 3279, *n.v.*; Haviland 1735, 3075; Pursglove P 4403.

Ecology. Coastal kerangas and secondary forest on eroded white sand; 0-50 m. Flowers throughout the year.

NOTES

1. *Fieldnotes.* Shrub or slender tree to c. 8 m tall. Sap pale pink, watery. Flowers yellow.

2. Apparently a member of the group of which leaves are pubescent and to which also belong *H. splendida*, *H. reticulata*, *H. rufo-lanata* and *H. tomentosa*, and somewhat more remotely, *H. grandis*. *H. paucinervis* is readily recognized by its few nerves, almost invisible reticulation and small male flowers, with few anthers.

3. I have seen only a few male flowering specimens, incl. Haviland 3075 and Pursglove P 4403 but not the type which is Beccari 3279, a female flowering one. This last is described and depicted by Warburg; Sinclair apparently also saw a specimen with immature fruits. It is odd that ovaries and fruits are reported as glabrous as they are pubescent in most related species though glabrous in *H. motleyi*.

64. *Horsfieldia splendida* de Wilde, *sp. nov.*

Fig. 1C(64); 24

Ramuli validi, tarde glabrescentes, pilis 1-1.5 mm longis obiecti, foliis ± oblongis, 18-45 cm longis, subtus tomento persistente. Perianthium masculum subglobosum, 1.5-2 mm diam., 3- vel 4- valvatum, androecio depresso-globoso, apice moderate excavato, antheris 8-10, sessilibus, androphoro angusto, 0.3-0.5 mm longo, pedicello gracili, basi non-articulato, fructibus late ellipsoideis, c. 2 cm longis, pubescenti, perianthio persistente. — Type: Sarawak, Othman Ismawi S 33723 (L; iso: NO, SAN, *n.v.*).

Tree 10-20(-30) m. Twigs stout, terete, towards apex 4-7(-13) mm diam., late glabrescent, tomentum densely woolly, yellow-brown to rusty, with hairs 1.0-1.5 mm, bark of older twigs usually dark brown or blackish, coarsely longitudinally striate and fissured, later on cracking and ± flaking; lenticels few, indistinct.

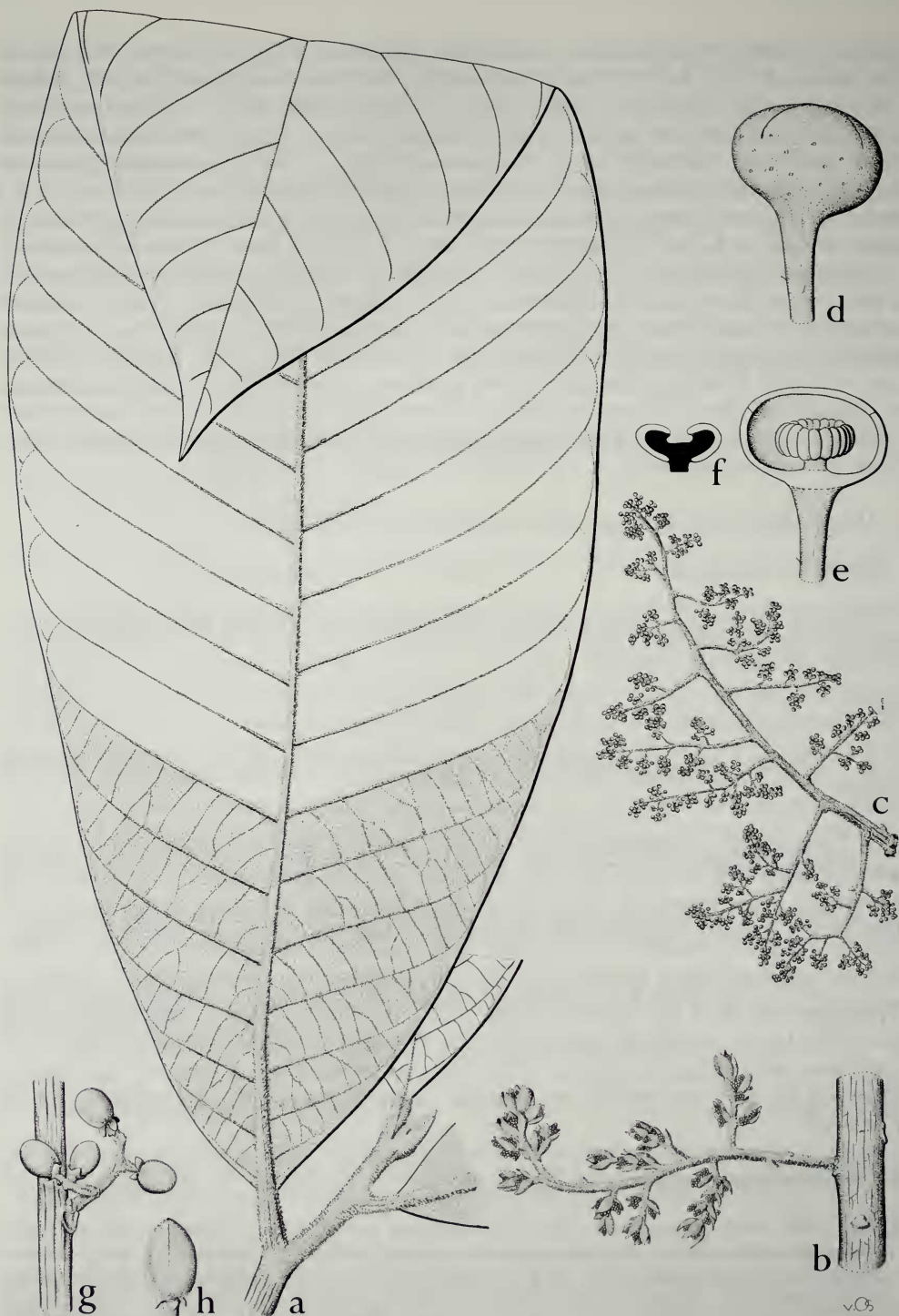


Fig. 24. *Horsfieldia splendida* de Wilde.

a. apical part of leafy twig, $\times \frac{1}{2}$; b. portion of twig with immature male inflorescence axillary to leaf scar, note bracts, $\times \frac{1}{2}$; c. mature male inflorescence, $\times \frac{1}{2}$; d. mature male flower, lateral view, $\times 12$; e. ditto, longitudinally opened, showing androecium, $\times 12$; f. androecium, longitudinal section, schematic, $\times 12$; g. portion of twig with infructescence, fruits immature, $\times \frac{1}{2}$; h. mature fruit, note persistent perianth, $\times \frac{1}{2}$. — a, b from Anderson 12916; c-f. from B.N.B. For. Dept. 4782; g. from San. 16927; h. from SFN 35606.

Leaves in 2 rows, membranous to chartaceous, elliptic-oblong to oblong-ob lanceolate, broadest usually above the middle, $18-45 \times 6.5-17$ cm, base almost rounded to attenuate, tip acute-acuminate; upper surface drying dull olivaceous to brown, not minutely pustulate, glabrous (early glabrescent), lower surface with conspicuous rather dense tomentum of loosely branched, stalked dendroid hairs, \pm evenly spaced and of about the same size, hairs 0.5-1.5 mm long; without larger blackish dots; midrib above late glabrescent, flat or slightly raised; nerves 18-25 pairs, above sunken, early glabrescent, the marginal arches usually distinct and regularly shaped; tertiary venation forming a lax network, generally distinct above; petioles $12-17 \times 3.5-5$ mm, pubescent; leaf bud c. $15(-20) \times 5$ mm, with hairs 1-1.5 mm long. Inflorescences densely woolly pubescent with dendroid hairs 1-1.5 mm, in σ : many-flowered, 4(or 5) times ramified, $6-16 \times 3-12(-16)$ cm, common peduncle 5-20 mm; φ inflorescences rather few-flowered, 3-5 cm long; bracts \pm ovate-triangular, acuminate, 0.4-1 cm long, densely pubescent, caducous. Flowers in σ in loose clusters, 3-(or 4)-valved, glabrous or thinly pubescent, pedicels slender, glabrous or subglabrescent, hairs 0.3-0.5 mm long, at base inarticulate. Male perianths subglobose, usually somewhat depressed, $1.4-2 \times 1.6-2$ mm, top broadly rounded, pedicels 1-1.5 mm long, slender; perianth at anthesis cleft to $\frac{1}{3}$ to nearly $\frac{1}{2}$ -way, valves c. 0.2 mm thick. Androecium depressed-subglobose, usually \pm impressed in the centre, circular or faintly 3-angular as seen from above, $0.5-0.6 \times 1-1.3$ mm; anthers 8-10, completely sessile, incurved towards the top; column broad, solid, leaving a small apical hollow of c. $\frac{1}{3}$ -($\frac{1}{2}$ -way) deep; androphore rather slender, 0.3(-0.5) mm long. Female perianth not seen, according to the persistent remnants under the fruit c. 3.0×2.5 mm, 3- or 4-valved, outside pubescent; pedicel 0.5-1.0 mm long, pubescent; ovary ovoid-ellipsoid, pubescent; stigma minutely 2-lobed, c. 0.1 mm high. Fruits 2-7 per infructescence, broadly ellipsoid, obtuse at apex, base rounded, $2.0-2.2 \times 1.5-1.8$ cm, pubescent (hairs c. 0.5 mm), drying brown, without lenticels or tubercles, dry valves c. 3 mm thick; stalk c. 1 mm long; perianth persistent.

Distribution. Borneo. Sarawak, Brunei, Sabah, E. Kalimantan; probably W. Kalimantan (see notes).

BORNEO. Sarawak: *Anderson 12916, 15526; Galau* (tree nr Semengo For. Res) 3500; *Motley* in Hb. Hooker 178; *Zen Osman 5140; S 33723; Seal 547; SFN 35606; Sinclair & Kadim 10227* — Sabah: *B.N.B. For. Dept. 4782; SAN 15390, 15487, 16656, 16927, 23739, 36333, 36592, 36660, 44688, 73393, 74992, 78355; Sinclair (Kapis & Kadim) 9292* — E. Kalimantan (W. Kutai): *Endert 5010*.

Ecology. Lowland mixed Dipterocarp forest, edges of swamp forest, kerangas forest (with *Dryobalanops fusca* dominant), also montane forest; brown soil, yellowish soil, tuff-plateau; 0-600(-1500) m alt. Flowers and fruits throughout the year.

NOTES

1. *Fieldnotes.* Bark of trunk usually recorded as blackish, brown, or red-brown and fissured or flaking. Inner bark soft, light brown or reddish, laminated, exudate reddish. Wood yellowish or whitish, recorded as soft or medium hard. Flowers yellow, fragrant (like the odour of Peru-balsam). Fruits recorded as red or orange.

2. The present new species contains the majority of the specimens which were determined as *H. reticulata* by Sinclair. However, the type of *H. reticulata*, *Beccari 3475* (FI, *n.v.*; iso: K) clearly represents a different species, one with the male

pedicels articulate at base, much smaller, more coriaceous, more distinctly reticulate leaves, and a much less pronounced indumentum on the lower surface. Its flowers, however, are almost similar, only a trifle larger. See further under that species.

3. I have not seen *Hans Winkler 388* (HBG), from West Kalimantan, determined by Sinclair as *H. reticulata*; may be it is our present new species *H. splendida*.

4. *H. splendida* is closely related to *H. reticulata*, *H. rufolanata*, *H. tomentosa*, and also *H. grandis* and less so to *H. flocculosa*; all these having similarly shaped and constructed male flowers. The perianth remains persistent under the fruit in these species except in *H. tomentosa* and *H. rufolanata*.

65. *Horsfieldia rufo-lanata* Airy-Shaw

Fig. 1C(65)

Horsfieldia rufo-lanata Airy-Shaw, Kew Bull. 10, 1939 (1940) 440; Sinclair, Gard. Bull. Sing. 28 (1975) 111 — Type: *Richards 1667* (K).

Tree 8-17 m. Twigs terete, towards the apex 3.5-5(-7) mm diam., late glabrescent, tomentum dark rusty to reddish-brown, of hairs 1-1.5 mm long, coarsely striate, bark of older twigs dark brown, \pm longitudinally cracking, not flaking; lenticels present but indistinct. Leaves in 2 rows, chartaceous, slightly or not bullate, elliptic to oblong, broadest at the middle, 10-23 \times 5-10(-12) cm, base nearly rounded to subattenuate, tip acute to acute-acuminate; upper surface drying olivaceous to brown, glabrous except the nerves, lower surface with dense to sparse tomentum of rather harsh hairs of mixed sizes ranging from sessile-stellate, c. 0.3 mm, to short-armed, dendroid emerging hairs up to c. 1.5 mm long; without larger blackish dots; midrib above \pm raised, late glabrescent; nerves 11-16 pairs, raised, pubescent or late glabrescent, the marginal arches distinct and regularly shaped; tertiary venation forming a lax network, sunken, distinct or not; petioles 10-16 \times 3-4.5 mm, pubescent; leaf bud 15-20 \times 3-5 mm with hairs 1-1.5 mm. Inflorescences densely woolly-shaggy pubescent, hairs 2.0-3.0 mm long, in σ^7 : many-flowered, 3 or 4 times ramified, 8-12 \times 5-7 cm, common peduncle 15-30 mm; in ϕ : few-flowered, c. 3 cm long; bracts densely shaggy pubescent, oblong-triangular to lanceolate, 3-8 mm long. Flowers in σ^7 in loose clusters, 3- or 4-valved, perianth glabrous, pedicel glabrous, at base indistinctly articulate. Male perianths subglobose, hardly or not depressed, c. 2 \times 2.3 mm, rather firm; pedicels not very slender, c. 0.5 mm thick, 0.5-1 mm long; perianth at anthesis cleft to nearly $\frac{1}{2}$ -way, valves 0.2(-0.3) mm thick. Androecium globose (not depressed-globose), c. 1.2 mm diam., not or only slightly apically impressed, circular in transverse section; anthers c. 15 (c. 28-30 thecae, very closely appressed), completely sessile, incurved towards apex; column broad, solid except for the small apical hollow to c. $\frac{1}{5}$, deep; androphore slender, c. 0.2 mm long. Female perianth not known. Fruits 2-4 per infructescence, broadly ovoid-ellipsoid, top and base rounded, 2.0-2.2 \times 1.5-1.6 cm, glabrescent, remnants of minute hairs c. 0.1 mm at the base, drying brown, without distinct lenticels or tubercles, dry valves c. 2 mm thick; stalk 1-3 mm long; perianth not persisting in mature fruit.

Distribution. Borneo: Sarawak (4th & 5th Div.), Sabah.

BORNEO. Sarawak: (*Brüning*) S 10599, n.v.; *Richards 1667* — Sabah: (*Wood*) SAN 16295; (*Meijer*) 26423.

Ecology. Montane forest, upper Dipterocarp forest on sandstone; 900-1400 m alt. Flowers in June and September, fruits in September.

NOTES. A montane species closely related to *H. splendida* and especially *H. reticulata*. Differs by the longer woolly tomentum of the inflorescences, the almost globose, hence not depressed-globose, male perianth, the near-globose androecium, more anthers, 13-15(-20) as against 8-10 and 10-12 in *H. splendida* and *H. reticulata* respectively. The nerves on the upper leaf surface apparently remain pubescent for a much longer time, and are generally raised. In contrast with *H. splendida*, the blades are generally smaller and more elliptic and have a tomentum of stiffer hairs on the lower surface; *H. reticulata* has a much less conspicuous tomentum on the lower leaf surface.

66. *Horsfieldia affinis* de Wilde, *sp. nov.*

Fig. 1C(66)

Folia membranacea, in sicco fusco-brunnea, subtus pilis persistentibus 0.5-1 mm longis obiecta. Flores masculi glabri, perianthio depresso-globose, 1.2-1.5 × 1.5-2.0 mm, 3 vel 4-valvato, androecio subglobose, c. 1 mm diam., apice excavato usque ad ½, antheris 11, sessilibus, pedicello tenere, basi articulo, fructibus ellipsoideis, c. 2.5 cm longis, glabris, perianthio persistente. — Type: Sarawak, E. Wright S 24718 (L; iso: K).

Tree 7-15 m. Twigs terete, towards the apex 3-6(-9) mm diam., late-glabrescent, tomentum of rusty hairs 0.5-1.0 mm long, lower down with the bark finely striate, when older not flaking; lenticels absent or small and inconspicuous. Leaves in 2 rows, membranous, not bullate, elliptic-oblong to lanceolate, broadest at or below the middle, 18-35 × 5-11 cm, base rounded to attenuate, top acute-acuminate; upper surface drying bright to dark or blackish brown, glabrous, lower surface with persistent, rather sparse tomentum of dendroid hairs or mixed with sessile stellate, dendroid hairs 0.5-1.0 mm long; scattered larger blackish dots absent; midrib flattish or slightly raised above, often late glabrescent; nerves 17-20 pairs, slender, raised, glabrous above, the lateral arches usually regularly shaped and distinct; tertiary venation forming a lax network, rather faint to distinct above; petioles 12-20 × 2-4 mm, pubescent; leaf bud rather slender, 10-15 × 3-4 mm, densely pubescent with hairs 0.5-1 mm. Inflorescences densely pubescent with rather shaggy hairs 0.5-2.0 mm long, in ♂: many-flowered, c. 4 or 5 times ramified, 12-25 × 8-14 cm, common peduncle 15-60 mm long; ♀ inflorescences 5-6 cm long, fewer-flowered than the males; bracts broad-triangular to elliptic-oblong, acute, 3-9 mm long, densely pubescent, caducous. Flowers in ♂ in loose clusters of 2-6 each, 3- or 4-valved; perianth glabrous, pedicel slender, glabrous, at base inarticulate. Male perianth depressed-globose, 1.2-1.5 × 1.5-2.0(-2.2) mm, top and base broadly rounded; pedicel slender, 1.5-2 mm long; perianth at anthesis cleft to c. ¼-⅓; valves c. 0.1 mm thick. Androecium subglobose or depressed globose, slightly impressed at the centre, ± circular in transverse section, c. 0.7-0.8 × 1.0-1.2 mm; anthers 11, completely sessile, incurved towards the apex; column broad, solid except the apical hollow up to c. ½-way deep; androphore slender or rather broad, 0.2-0.3 mm long, hidden or not by the anthers. Female flowers not seen; perianth as judged from remnants under the fruit 2.5-3.0 × 2-2.5 mm, valves 3, splitting the bud to over ½-way, glabrous or probably with very weak tomentum. Fruits 4-7 per infructescence, ellipsoid, top and base rounded, 2.3-2.7 × 1.7 × 2.1 cm, glabrous, drying brown, without lenticels but paler, wart-like tubercles present, dry valves 1.5-2.0 mm thick; stalk 3-4 mm long; perianth persistent under the fruit.

Distribution. Borneo: Sarawak; Brunei; Central, East and SE. Kalimantan.

BORNEO. Sarawak (Kapit, 3rd Div.): Wright S 24718; (Chai) S 36018 — Brunei: (Abdul Latip) BRUN 5654 — Kalimantan, East & SE.: Enderi 2595; Kostermans 9535, 21760; Leighton 700, 737 930; Sauveur 1 14, 126; Central: Nooteboom 4847.

Ecology. Forest on alluvial soils, riverbanks; sandy clay soil, sandy ridges, sandstone; 0-600 m alt. Flowers May to November, fruits in July.

Vernacular name. Kumpang balau (Iban name, Kapit area, Sarawak).

NOTES

1. *Fieldnotes.* Small tree, crown pyramidal, no buttresses. Bark rough, dark brown, lenticellate; outer bark 1-2 mm thick, brown-red, inside red. Flowers dark or golden yellow, fragrant or with strong sweet smell of Peru-balsam. Fruits ramiflorous, in bunches behind the leaves, pinkish-orange.

2. Most specimens of the present new species were included by Sinclair in *H. motleyi*, which differs by the inarticulate pedicels, the much smaller pubescent flowers with a quite different androecium, the leaves drying to a dull olivaceous brown colour, and the sunken lateral nerves.

3. *H. affinis* is among its closest relatives characterized by the distinctly articulate, glabrous, male pedicels, the male flowers being arranged in small clusters at the end of the slightly thickened hairy inflorescence-ramifications. A second related species with articulate pedicels is *H. reticulata*, and possibly *H. rufo-lanata* the position of which is unconfirmable because there are not enough flowers available.

67. *Horsfieldia reticulata* Warb.

Fig. 1C(67)

Horsfieldia reticulata Warb., Mon. Myrist. (1897) 304, t. 22 fig. 1-3; Merr., En. Born. J. Str. Br. R. As. Soc. special number (1921) 268; Sinclair, Gard. Bull. Sing. 28 (1975) 107 — *Myristica reticulata* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 85 — Type: Sarawak, Beccari 3475 (Fl. n.v.; iso: K).

Tree to c. 20 m. Twigs terete, towards the apex 2.5-4(-8) mm diam., late glabrescent, tomentum rusty, of rather coarse hairs c. 1.0 mm long, bark of older twigs dark grey, coarsely striate, later on finely longitudinally and transversely cracked; no lenticels seen. Leaves in 2 rows, chartaceous, \pm bullate, elliptic to oblong-oblancoate, broadest at or above the middle, 8-24 \times 4-6.5 cm, base rounded, top acute-acuminate; upper surface drying blackish brown, glabrous, lower surface bright dark brown, with persistent tomentum composed of rather spaced hairs of various sizes, i.e., stellate sessile hairs, and long-emergent short-armed dendroid hairs up to c. 0.7 mm long as well as intermediate forms; larger blackish dots absent; midrib raised above, glabrous; nerves 9-19 pairs, sunken, glabrous, the marginal arches distinct and regular; tertiary venation forming a lax network, very distinct on both surfaces; petioles 7-15 \times 2-3 mm, pubescent; leaf bud not seen. Inflorescences in σ : on the older wood, densely pubescent with hairs 0.5-1.0 mm, many-flowered, c. 4 times ramified, c. 18 \times 12 cm, common peduncle 20-25 mm; bracts not seen, caducous. Flowers 3(-5)-valved in small loose clusters; perianth glabrous; pedicels glabrous, at base articulate. Male perianth somewhat depressed-globose, 1.5-2.0 \times 2.0-2.5 mm, top and base broadly rounded; pedicel slender, 0.5-1.5 mm long; perianth at anthesis cleft to c. $\frac{1}{4}$ to nearly $\frac{1}{2}$ -way; valves 0.1-0.2 mm thick. Androecium much depressed-globose, impressed in the centre, c. 0.6-0.7 \times 1.2-1.5 mm, in transverse section \pm ellipsoid or faintly 3-angular; anthers c. 10-12 or c. 15 (see notes), \pm completely sessile, incurved towards the

top; column broad, solid except for an apical hollow with flattish bottom reaching to depth of c. $\frac{1}{3}$ to nearly $\frac{1}{2}$ -way; androphore rather slender, 0.3-0.4 mm long, largely hidden by the anthers. Female flowers and fruits not seen.

Distribution. Borneo: Sarawak (2nd. Div.), East & West Kalimantan.

BORNEO. Sarawak (2nd Div.): *Beccari 3475* — Kalimantan: West, *Hans Winkler 388*; East, *Leighton 655* (possibly, material incomplete).

Ecology. Forest at c. 100 m. alt. Flowers in November.

NOTES

1. *Fieldnotes.* Flowers yellow. Fruits sourish, eaten by the Dajaks.

2. This species appears to be represented only by the type and two collections from West-Central and East Kalimantan. Most specimens considered by Sinclair as conspecific (Sinclair, p. 107, 108) belong to a presently described new species, *H. splendida*. Sinclair observed that the Beccari specimen looked somewhat different, but regarded it as a relatively glabrous specimen from which most tomentum had dropped off. *H. splendida* differs, in addition to the inarticulate pedicels, by the much less bullate and larger leaves, by the tomentum (of the lower leaf surface) of a different structure; the dendroid hairs being more widely branched, all \pm evenly long-stalked, and by its somewhat smaller male perianth. It should be noted, however, that the male flower including the androecium, is much the same in all species of the group of obviously related species to which *H. grandis*, *H. tomentosa*, *H. flocculosa* also belong. Because of the articulate pedicels, *H. reticulata* seems most related to *H. affinis*.

3. The general habit of the leaves and inflorescences of the few collections seen by me is very much the same, the leaves being brittle-chartaceous, drying dark brown, with a tomentum rather harsh and a very pronounced reticulation which is impressed above. The last gives the leaves a distinct bullate appearance, more so because the leaf-margin is revolute. The androecia of the two male flowering specimens seen, however, are rather different. In *Beccari 3475* I counted (9 or) 10-12 anthers, in *Winkler 388* there are apparently c. 15 anthers (c. 30 thecae), and the apical hollow of the column in the collection is generally broader, and has a wide, flattish bottom.

68. *Horsfieldia crassifolia* (Hook. f. & Th.) Warb.

Fig. 1C(68); 25

Myristica crassifolia Hook. f. & Th., Fl. Ind. (1855) 160; A. DC., Prod. 14, 1 (1856) 204; Miq., Fl. Ind. Bat. 1 (2), 1 (1858) 68; Hook. f., Fl. Brit. Ind. 5 (1886) 108; King., Ann. Roy. Bot. Gard. Calc. 3 (1891) 308, pl. 140 — *Horsfieldia crassifolia* (Hook. f. & Th.) Warb., Mon. Myrist. (1897) 323 (p.p); Sinclair, Gard. Bull. Sing. 16 (1958) 386, fig. 34, Pl. X A: 28 (1975) 23; Anderson, Gard. Bull. Sing. 20 (1963) 195 — *M. irya* var. *crassifolia* Miq. ex Hook. f., Fl. Brit. Ind. 5 (1886) 108, *pro syn.* — Type *Griffith 4350* (K; iso: CAL, n.v.) (see notes by Sinclair, l.c. pag. 25).

M. horsfieldia auct. non. Bl.: Wall. Cat. (1832) No 6806, p.p. (other parts are *H. polyspherula* and *H. wallichii*).

M. subglobosa Miq., Fl. Ind. Bat. Suppl. 1, 3 (1861) p.p. (other part is *H. irya*).

M. paludicola King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 328, pl. 169 — *H. fulva* (King) Warb. var. *paludicola* (King) Warb., Mon. Myrist. (1897) 299 — Type: *King's Coll. 4267* (CAL, n.v.; iso: L, BM), 4706 (CAL, n.v.; iso: L, K, BM), 6688 (CAL, n.v.; iso: K); *Wray 3071* (CAL, n.v.; iso: K, L).



Fig. 25. *Horsfieldia crassifolia* (Hook.f. & Th.) Warb.

a. branch with leafy twig and infructescence with mature fruits, note persistent perianth and aril completely closed, $\times \frac{1}{2}$; b. portion of twig with male inflorescence, $\times \frac{1}{2}$; c. mature male flower, lateral view, $\times 12$; d. ditto, longitudinally opened, showing androecium, $\times 12$; e. portion of older twig with female inflorescence axillary to leaf scar, $\times \frac{1}{2}$; f. mature female flower, opened, showing glabrous ovary and 2-lipped stigma, note flower considerably larger than male flower, $\times 12$; g. portion of lower leaf surface with persistent tomentum and irregularly shaped dark-coloured dots, $\times 25$. — a. from *Mondi 51*; b-d. from *S 9226*; e-g. from *San. 27183*.

Tree 10-25 m. Twigs terete, not ridged, towards apex 2-6(-8) mm diam., rather early glabrescent, tomentum yellow-brown to rusty woolly, with hairs 0.2-0.5 mm; bark coarsely striate, when older not flaking, lenticels sparse to dense, distinct or not. Leaves in 2 rows, coriaceous, elliptic to oblong, 10-20(-28) \times 3.5-7(-10) cm, base rounded to attenuate, top rounded to subacute or rarely emarginate; upper surface drying dull greenish brown to dark brown, not finely pustulate, lower surface either largely or partly covered with subpersistent tomentum consisting of interwoven stellate scales c. 0.1 mm high (when very young with dendroid emergents), or glabrescent and then showing distinct hair scars and usually scattered blackish dots or dashes; midrib above flattish; nerves 11-16 pairs, above thin and flattish or sunken; tertiary veins indistinct or invisible on both surfaces; petiole 9-20(-30) \times 1.5-4.5 mm, leaf bud 7-12 \times 2-3 mm with hairs 0.2-0.5 mm. Inflorescences situated in between or usually behind the leaves, late glabrescent or with a persistent, rather dense, woolly tomentum of dendroid hairs 0.2-0.5 mm; in ♂: 3-5 times ramified, broadly paniculate, many-flowered, 6-20 \times 4-15 cm, common peduncle 5-20 mm; in ♀: 3-14 cm long; bracts elliptic-lanceolate, 2-5(-7) mm long, pubescent, caducous. Flowers in loose clusters of 2-7, glabrous; perianths 2-valved; pedicels slender, glabrous, at base inarticulate. Male perianth globose or slightly transversely ellipsoid, (0.8-)1.0-1.3 \times 1-1.5 mm, the upper part broadly rounded, the base broadly rounded to flattish, pedicel c. 0.3-1 mm long; perianth at anthesis cleft to c. $\frac{1}{3}$ - $\frac{1}{2}$ (- $\frac{2}{3}$), valves 0.2-0.3 mm thick. Androecium globose or \pm transversely ellipsoid, not or only faintly laterally compressed, c. 0.4-0.5 \times 0.5-0.8 mm; anthers 4-6(thecae 8-12), \pm septate before maturity, widely spaced, and with broad connectives (giving the androecium an angular appearance), the anthers free for almost the upper half or more; androphore c. 0.2(-0.3) mm long, slender. Female perianth broadly obovoid, 2-3 \times 2-2.5 mm, split at anthesis for $\frac{1}{5}$ - $\frac{1}{3}$ only, valves 0.6-1 mm thick; pedicel 1.5-2.5 mm long; ovary obovoid, glabrous, 1.5 \times 1.2-1.5 mm, stigma minute, consisting of 2 small lobes c. 0.1-0.2 mm high, running out into a faint ridge at one side of the ovary. Fruits (1-)2-10 per infructescence, ovoid to obovoid, base and top rounded, 1.5-2.2 \times 1.2-1.8 cm, glabrous, drying dark brown, with few or no lenticel-like tubercles; dry valves 1.5-2 mm thick; stalk 2-5(-7) mm long; perianth persisting under the fruit.

Distribution. Malaya (Perak, Trengganu, Selangor, Negri Sembilan, Malacca, Johore), Singapore, Sumatra (incl. Indragiri, Riau, Bangka & Belitung), Borneo; absent in S. Thailand.

MALAYA. *Anderson* 9; *Derry* 1163; *FRI* 0021 7727, 17634; *Hb. Griffith* 4350; *KEP* 70486; *King's Coll.* 4267, 4706, 6688; *K.C. Liew* 166; *SFN* 32105, 40567, 40898; *Wray* 3071.

SINGAPORE. *Ridley* 1819, 1828, 3831, 5826, 6126, 6909, 10695; *SFN* 34542, 34905, 37710, 39533, 40256.

SUMATRA. *Tapanuli*: *b.b.* 28169, 28399, 29545; *Rahmat si Toroes* 4829; *Theunissen* 59, 60 — *W. Coast*: *b.b.* 5952; *Korthals s.n.* — *E. Coast*: *b.b.* 21290 — *Riau*: *b.b.* 20375 — *Bangka*: *Grashoff* 117.

BORNEO. *Sarawak*: *Anderson* 9028; *Haviland & Hose* 1941; *S* 9226, 12325, 32021; *Sanusi bin Tahir* 5204, 9279; *SFN* 36078 — *Brunei*: *Brun.* 375, 838; *Sinclair & Kadim* 10473 — *Sabah*: *B.N.B. For. Dept.* 10604; *Kokawa & Hotta* 326; *SAN A* 4562, 4598, 24313, 27131, 27183, 27826, 78031, 84511 — *Kalimantan*: *West, Mondi* 51 — *East & SE.*: *b.b.* 9937, 32404, *Kostermans* 4189, 9857A, 10097; *de Vriese s.n.*

Ecology. Mostly in marshy forest, freshwater and peat swamp-forest; on sandy soils, c. 0-200 m alt. Flowers and fruits throughout the year.

Vernacular names. Jangkang paya (Malay); Kajoe haroeja (Batak), Kumpang ensulieue, Kumpang sadara, Terada'a, Ta'dara (Sarawak, *vide* Anderson).

NOTES

1. *Fieldnotes*. A few stilt roots or low buttresses occasionally recorded. Flowers often recorded as yellow, strongly scented. Bark greyish, fissured, flaking in small rectangular scales.

2. The lower surface of the leaves of Bornean material tend to become somewhat earlier glabrescent as compared with those in Sumatra and Malaya.

3. May be confused with *H. fulva*, a species also with \pm coriaceous leaves and a persistent perianth on the fruit, but this has a 3-merous perianth. Sterile specimens of the present species may be recognized by the coriaceous leaves, and on the lower surface by the usually persistent 'scaly' tomentum, and the usually present sparse to rather dense irregularly-shaped dark-brown dots and streaks. Sinclair (1975, p. 26) remarks that the species can easily be recognized from a distance by its rusty or cinnamon-brown colour of the lower leaf surface. The species is very constant in habit, characters, and habitat.

It has few (only c. 4-6) well separated anthers, the androecium being typically narrowly attached to the base of the perianth.

It is one of the few West Malesian species with a 2-valved perianth.

69. *Horsfieldia carnosa* Warb.

Fig. 1C(69); 26

Horsfieldia carnosa Warb., Mon. Myrist. (1897) 348, 619; Merr., En. Born. J. Str. Br. R. As. Soc. spec. number (1921) 268; Sinclair, Gard. Bull. Sing. 28 (1975) 21. — *Myristica carnosa* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 87 — Type: *Beccari 344* (FI Acc. 7624), young male fl. (FI, n.v.); 1242 (FI Acc. 7625), fr. (FI, n.v.; iso: K, P).

Tree 4-10 m. Twigs terete, stoutish, towards apex 3-10(-16) mm diam., early glabrescent from a grey-brown tomentum composed of hairs c. 0.1 mm, bark of older twigs coarsely or finely striate, with a tendency to flake, drying somewhat pale, yellow-brown or light grey-brown, generally rather contrasting with the blackish brown colour of the dry petioles, lenticles usually not conspicuous. Leaves in 2 rows, chartaceous-coriaceous, rarely \pm membranous, elliptic-oblong to oblong, broadest at or slightly above the middle, 13-35 \times 5-11 cm, base long- or sometimes short-attenuate, top acute-acuminate; upper surface drying bright dark brown, with a finely wrinkled-granulate structure, glabrous, lower surface early glabrescent (glabrous), without blackish dots; midrib above flat; nerves 13-18 pairs, flat above, the marginal arches indistinct; tertiary venation forming a lax network, faint or invisible on both surfaces; petioles 10-16 \times 2-4 mm, glabrous or early glabrescent; leaf bud 9-13 \times 2-3 mm, with grey-brown tomentum of hairs c. 0.1 mm long. Inflorescences densely to rather sparsely set with hairs c. 0.1 mm or less, in σ : many-flowered, 3 or 4 times ramified, 6-17 \times 5-14 cm, common peduncle 10-30 mm; in ρ : ramiflorous, rather many-flowered, c. 1-2 cm long, the flowers rather clustered; bracts elliptic to oblong, 4-10 mm long, pubescent, caducous. Flowers 3-valved, glabrous, in σ in loose clusters of 3-9 each, pedicels 1-1.5 mm long, rather slender, glabrous, at base inarticulate. Male perianths globose or subglobose, 1.9-2.1 \times 1.8-2.0 mm, top and base (broadly) rounded; pedicels 1.0-1.5 mm long; perianth at anthesis cleft to $\frac{1}{3}$ - $\frac{1}{2}$, valves c. 0.2 mm thick, perianth not collapsing on drying. Androecium (sub)globose, 1.0-1.2 \times 1.0-1.3 mm, circular in transverse section; anthers 9-11 (thecae 18-22), completely sessile (free apices \pm 0),

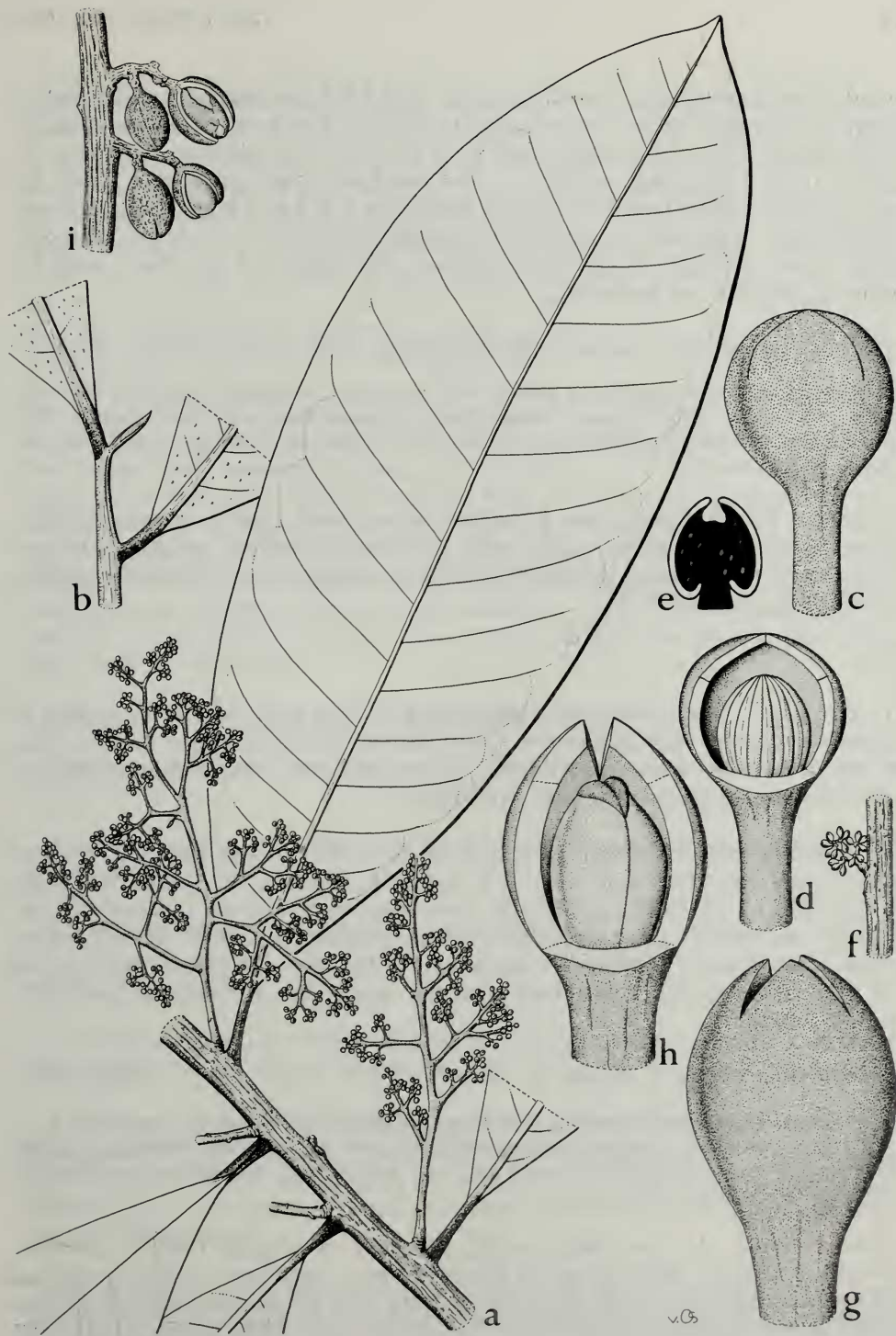


Fig. 26. *Horsfieldia carnosa* Warb.

a. portion of twig with leaf and male infloresces, $\times \frac{1}{2}$; b. apical part of leafy twig, note pale colour of stem contrasting with dark drying colour of the petioles, $\times \frac{1}{2}$; c. mature male flower, lateral view, $\times 12$; d. ditto, opened, showing androecium, $\times 12$; e. androecium, longitudinal section, schematic, $\times 12$; f. portion of twig with female inflorescence axillary to leaf scar, $\times \frac{1}{2}$; g. female flower in anthesis, lateral view, $\times 12$; h. ditto, longitudinally opened, showing glabrous ovary with broadly 2-lipped stigmas, $\times 12$; i. portion of older twig with infructescences, fruits mature, aril complete but torn by drying, $\times \frac{1}{2}$. — a. from van Niel 5419; b-e. from S. 18011; f-h. from San. 63191; i. from San. 17438.

curved, at apex concealing a small apical cavity 0.2-0.4 mm deep; column broad, \pm spongy, androphore rather narrow, distinct, 0.2-0.5 mm long, completely hidden by the anthers. Female perianth ellipsoid, c. 3.5×2.5 mm, glabrous, cleft to c. $\frac{1}{3}$, valves c. 0.3-0.4 mm thick, pedicels c. 1-1.5 mm long, ovary ellipsoid, c. 2.0×1.5 mm, glabrous, stigma consisting of two broad lips c. 0.2 mm high. Fruits 2-11 per infructescence, ellipsoid, top and base rounded, $1.6-2.0 \times 1.2-1.5$ cm, glabrous, drying brown with a finely granulated surface; pericarp c. 1.5 mm thick; stalk 1-2 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Brunei, Sabah, West Kalimantan (G. Klam).

BORNEO. Sarawak: *Beccari 1242; Clemens 22345; Haviland & Hose 2096; Native Coll. 676, 1970; S 15456, 15955, 18011, 32713; Sinclair & Kadim 10428* — Brunei: *Fuchs et al. 21193; Van Niel 4519; Brünig S. 1071* — Sabah: *B.N.B. For Dept. 2378; SAN 17438, 63191, 73218, 80063* — West Kalimantan, G. Klam: *H. Hallier 2381*.

Ecology. Heath forest, wet kerangas forest, peat swamp forest, *Agathis-Casuarina* forest; on white sandy soils; 0-100m alt; flowers mainly in July to November, fruits collected throughout the year. An extensive note on the ecology is given by Sinclair on p. 22.

NOTES

1. *Fieldnotes.* A low tree with slender trunk to 10 m high. Bark often flaking or shallowly fissured. Twigs light brown. Inner bark yellowish, thin, Sap watery, clear, not red or reddish. Sapwood whitish. Flowers greenish-yellow, anthers whitish. Fruits (immature) greenish-yellow, aril orange.

2. This is a well-characterized species of low trees of the Kerangas or peat swamp forest, on white sand soils. It is distantly related to *H. glabra*, but easily distinguished by its usually stout habit, pale twigs with the bark tending to flake, the large and usually chartaceous-coriaceous (possibly somewhat fleshy) leaves, globose male flowers, the pedicels inarticulate at the base, the globose androecium with distinct but hidden androphore, and the small often \pm clustered fruits of c. 1.6-2 cm length.

70. *Horsfieldia sterilis* de Wilde, *sp. nov.*

Fig. 1C(70)

Folia membranacea, in sicco nigrescentia. Perianthium masculum late obovoideum. \pm carnosum, c. 1.7 mm longum, 2-valvatum, alabaströ in anthesi usque ad $\frac{1}{4}$ fissio, androecio late obovoideo, c. 0.8 mm longo, apice non-excavato, antheris 3, c. 0.4 mm longis, sessilibus. — Type: Sabah, *Aban Gibot SAN 30597* (L; iso: K; SING, *n.v.*).

Tree or shrub, 3-12 m. Twigs terete, not lined or winged, towards the apex 2.5-4(-8) mm diam., dark brown or greyish brown, sometimes rather contrasting with the blackish colour of the dry petioles, bark early glabrescent, tomentum rusty to grey-brown, with hairs 0.1-0.2 mm; bark lower down finely striate, not tending to crack or flake; lenticels conspicuous or not. Leaves in 2 rows, membranous, elliptic-oblong to oblong(-lanceolate), broadest at or slightly above the middle, $13-33 \times 4.5-9$ cm, base attenuate, top acute-acuminate; upper surface glabrous, drying rather dark brown to blackish, lower surface glabrous, drying brownish, without scattered larger dark-coloured dots; midrib flat above, glabrous; nerves 11-17 pairs, flattish or slightly raised above, lateral arches not particularly distinct; tertiary venation forming a lax network, faint or invisible on both surfaces; petioles $7-20 \times 2-3.5$ mm, glabrous (early glabrescent); leaf bud slender, $7-12 \times 2-2.5$ mm,

densely (pale) rusty pubescent with hairs 0.1-0.2 mm long. Inflorescences subglabrescent, tomentum rather weak, of hairs 0.1-0.2 mm long, in ♂: rather lax, 10-20 × 5-8 cm with rather few side-branches, 2 or 3 times ramified, moderately densely flowered, common peduncle long, with several bract-scars, 30-90 mm long, flowers in loose clusters of 2-6 each; ♀ inflorescences elongate, slightly-branched, almost spike-like, 5-10 cm long; perianths glabrous, 2-valved, pedicel glabrous, at base inarticulate; bracts ablong-lanceolate, 3-8 mm long, acute, pubescent with hairs 0.1-0.3 mm especially at the margins, caducous. Male perianth broadly obovoid-subglobose, 1.5-1.7 mm diam., top broadly rounded or somewhat depressed, base sub-attenuate, glabrous; pedicel 1-1.5 mm long, slender; perianth at anthesis cleft to c. ¼, valves rather thick-fleshy, 0.3-0.4 mm thick, the perianth shrinking, not collapsing on drying. Androecium broadly obovoid, c. 0.8 × 0.6-0.7 mm, top ± rounded, subcircular in transverse section; anthers 3 or (6?) (i.e. with 5-6 thecae), completely sessile, c. 0.4 mm long, occupying only the apical part of the androecium, connectives broad, ± triangular, with narrow thecae; column broad and solid, apical cavity absent or very inconspicuous; androphore conspicuous, broad, tapering to below, c. 0.4 mm long. Female flowers not seen; according to persistent perianths under immature fruits: perianth c. 2.5 mm long, 2-valved, glabrous. Fruits (immature ones, *B.N.B. For. Dept.* 27) 4-10 per spike-like infructescence, ellipsoid, top and base rounded, c. 2.2 × 1.8 cm, glabrous, drying blackish, not tubercled, pericarp c. 2 mm thick; perianth persisting under immature fruit; stalk 3-4 mm long.

Distribution. Borneo: Sabah, a local endemic of SE. Sabah.

BORNEO, Sabah, Tawau Dist.: (*Orolfo*) *B.N.B. For. Dept.* 27; (*Aban Gibot*) SAN 30597; (*Shea*) SAN 75748, 95959.

Ecology. Small trees or shrubs in forest on hillsides and riverbanks; at. 80-500 m alt. Flowers April to July.

Vernacular name. Duria (Sabah, Tawau Dist.).

NOTES

1. *Fieldnotes.* Small trees or shrubs; bark greybrown, non-fissured. Inner bark with orange-red sap. Sapwood pale yellow.

2. A species notable by its 2-valved perianth and the subconical broadly obovoid androecium of which only the apical half bears 3 or 6 rather much-reduced anthers; the basal part of the androecium or androphore is sterile, broad and tapering. Whether there are actually 6 anthers or only 3 anthers each with 2 thecae requires further confirmation.

The structure of the androecium is reminiscent of that of species like *H. crux-melitensis* and *H. clavata* from New Guinea, but in these species the androecium is much more elongate. In general habit the new species resembles e.g. *H. pallidicaula* or *H. sucosa*, because of its rather pale twigs and blackish drying leaves, but our present species differs by much more elongated inflorescences.

3. The type specimen was not treated under *Horsfieldia* by Sinclair. A second specimen (*Orolfo*, *B.N.B. For. Dept.* 27) was identified by him as *H. bracteosa* var. *microcarya*.